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Project Completion Report

STRIP COAL MINING AND MINED-LAND RECLAMATION IN THE HYDROLOGIC SYSTEM, SOUTHEASTERN MONTANA

by

Wayne A. Van Voast
Robert B. Hedges
John J. McDermott

Hydrogeologists at

Montana Bureau of Mines and Geology
3021-6th Avenue North
Billings, Montana 59101

and

Montana College of Mineral Science and Technology
Butte, Montana 59701

December, 1978

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STRIP COAL MINING AND MINED-LAND RECLAMATION IN THE HYDROLOGIC SYSTEM, SOUTHEASTERN MONTANA

ABSTRACT

Coal beds that are locally important aquifers for southeastern Montana's agricultural economy are being removed as mining development occurs. Overburden rock materials (spoils) replace the coal beds as aquifers. As mine pits are backfilled, ground waters readily reenter the spoils.

Hydraulic-conductivity values for saturated spoils were found to be lognormally distributed. Lognormal mean values range from 0.06 m/day at Decker to 0.11 m/day at Colstrip. Sixty-six tests conducted in undisturbed coal-bed aquifers throughout the region yielded a lognormal mean value of 0.29 m/day. Storage-coefficient values for spoils were low (0.00001 to 0.00003), indicating that the flow systems in mine spoils are probably confined within rubble-strewn mine floors overlain by finer-grained materials.

The chemistry of spoils waters is diverse, reflecting the lithologic and geochemical variability of overburden materials. At Decker, predominant ions in spoils waters are sodium and bicarbonate; at Colstrip, they are magnesium, calcium, and sulfate. Statistically, spoils waters in both areas are more highly mineralized than nearby stock and domestic waters.

Column leaching experiments conducted with spoils produced leachates that were chemically similar to waters found in the field. First pore volumes of the leachate were also chemically similar to saturated-paste extracts.

The relationships between saturated-paste-extracts quality and spoils-water quality were utilized to develop generalized nomographs for predicting spoils-water cation concentrations from pre-mining paste-extract chemistry. Similar attempts toward predictive nomographs utilizing specific conductance were unsuccessful.

INTRODUCTION

An increasing scale of development of Fort Union coal has caused concern for all factors of southeastern Montana's environment. Concerns for water resources have been particularly great because of the extreme water dependency of the coal region's agricultural community. Since 1971, the Montana Bureau of Mines and Geology at the Montana College of

Mineral Science and Technology has been conducting research at several mine sites in the region to determine hydrologic conditions before and during mining and to predict conditions after mining operations are completed.

Research described in this report was funded principally by grants from the Old West Regional Commission and the U.S. Environmental Protection Agency. Funds from the Old West Regional Commission were provided under OWRC Grant No. 10570165, entitled, "Hydrologic Characteristics of Mine Spoils." Funds from the U.S. Environmental Protection Agency were provided under Grant No. R-803727-03-1, entitled "Cooperative Program to Evaluate Surface and Ground Water Problems Associated with Potential Strip Mine Sites." That grant also supported mining-related hydrologic research at other colleges and universities in Montana, North Dakota, and Wyoming, in addition to the work described herein. Funds from these two grants enabled most of the research described in this report as well as the incorporation of many data that had been collected under other projects supported by diverse funding sources. This report therefore includes data and interpretations from all surface-mining-related hydrologic research that has been conducted by the Montana Bureau of Mines and Geology, Montana College of Mineral Science and Technology.

The coal region of Montana lies within the high plains province, and includes both gently rolling and very rugged terrain. Land-surface altitudes range from about 800 meters above sea level to about 1,500 meters above sea level. Local relief along watercourses is commonly 100 meters or more. Stream valleys tend to be long and narrow, in many places flanked by escarpments; tributary drainages are characteristically

steep-sided gulches, locally known as coulees. Southeastern Montana's climate is typical of the Northern Great Plains. Cold winters and hot summers are common; average temperature in January is about -5°C, and in July is about 22°C. Annual precipitation varies areally from about 300 millimeters to about 400 millimeters, of which about 60 percent falls during the growing season (May through September).

The region occupies the northern end of the Powder River structural basin. Most of the land surface is formed on the Fort Union Formation (Paleocene in age), a series of freshwater sandstone, siltstone, claystone, and coal beds. Within the uppermost unit of the Fort Union Formation (the Tongue River Member), 26 coal beds have been identified and analyzed (Matson and Blumer, 1973) that have thicknesses between 1 meter and 25 meters. Coals in Montana's portion of the Fort Union Region (Fig. 1) are lignite with heating values less than 4,600 kcal/kg (kilocalories per kilogram), and subbituminous with heating values between 4,600 kcal/kg and 5,500 kcal/kg; thus far, the subbituminous beds have been the objects of the most active development. Thickness, areal persistence, low-sulfur content (generally less than 1 percent), and shallow depths combine to make the subbituminous reserves economically attractive. Matson and Blumer (1974) estimated that strippable subbituminous reserves are at least 13.3 billion tonnes, and underlie an area of approximately 123,000 hectares. Their figures do not include the yet-unpublished reserves under the Northern Cheyenne and Crow Indian Reservations.

Coal has been mined in the Region by individuals and small concerns for many years. Most of these operations have been underground, and have had little noticeable effect on the land. One exception is the Rosebud mine at Colstrip, strip-operated for the Northern Pacific

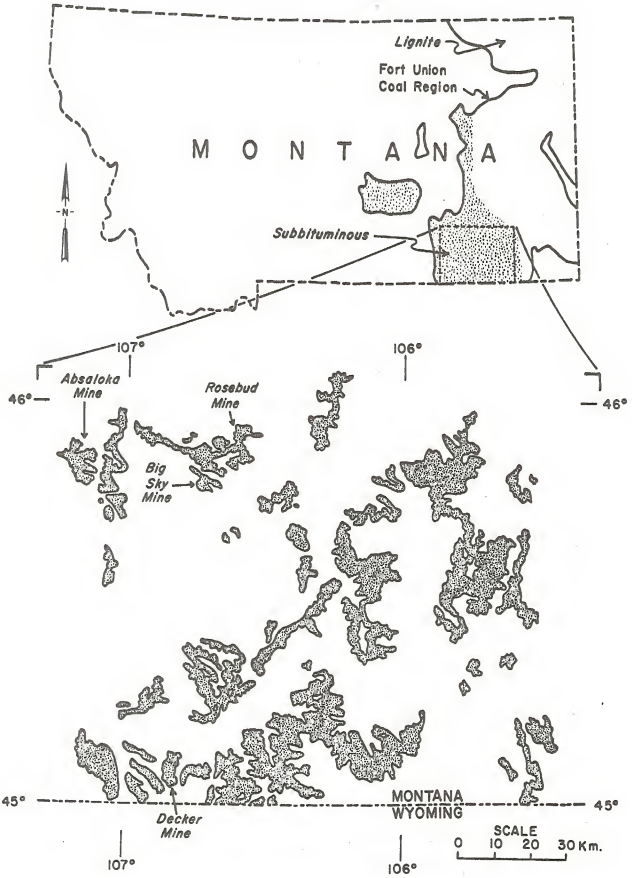


Figure 1.-Mine-area study sites and other subbituminous coal fields in southeastern Montana.

Railway Company between 1924 and 1958. Larger scale surface mining has since come to the subbituminous fields (Fig. 1): Western Energy Company reopened the Rosebud mine in 1968; Peabody Coal Company opened the Big Sky mine near Colstrip in 1969; Decker Coal Company opened the Decker mine near the Montana-Wyoming border in 1972; and Westmoreland Resources opened the Absaloka mine near Sarpy Creek in 1974. All of these operators have additional areas planned for future expansion, and many others are maneuvering for reserves. The central part of the Region in Montana is currently undeveloped, but most coal not controlled by the Federal Government has been leased. The probability of widespread development grows as America searches for more energy sources within our borders.

Energy is not the only resource that southeastern Montana coal can provide. The coal beds, because of their generally fractured characteristics and large areal continuities, are commonly the most accessible and widely used aquifers of the region. In this semi-arid climate, many inhabitants are almost totally dependent upon ground water for stock and domestic supplies and in many places they obtain it from coal beds that will be removed by mining. Concerns logically arise over the possible impacts of mining upon water supplies that are vital for agriculture.

Data-Point Numbering System

The system of numbering data points in this report is based on the U.S. Bureau of Land Management system of subdivision of the public lands. The research sites lie within the Montana Principal Meridian system; data-point numbers are ascribed that identify specific locations within the system. The first segment of a data-point number indicates the township north or south of the baseline; the second, the range east of the principal meridian; and the third, the section in which the data

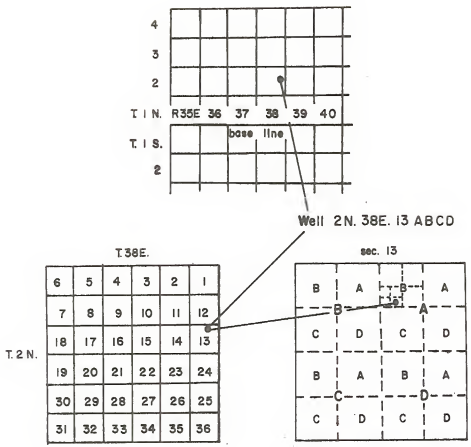


Figure 2.-Data-point numbering system.

point is located (Fig. 2). The letters A, B, C, and D, following the section number, locate the point within the section. The first letter denotes the 160-acre tract; the second, the 40-acre tract; the third, the 10-acre tract; and the fourth, the 2½-acre tract. The letters are assigned in a counterclockwise direction, beginning in the northeast quadrant. If two or more data points are located within the same 2½-acre tract, numbers are added as suffixes. It is important to note that the order of quarter-tract designations is exactly reversed from that commonly used by surveyors; here the order begins with the largest quarter and progresses to the smallest. Thus, in Figure 2, the designation 2 N., 38 E., 13 ABCD identifies the first data point in the SE¼ SW¼ NW¼ NE¼ sec. 13, T. 2N., R.38E.

In addition to the system described above, several prefixes such as "S", "EPA", "BS", and "WR" are ascribed to research wells shown in figures and tables of the report. The prefixes were not assigned by any uniform system, but evolved over several years of research. They are used in the report because they serve as brief identifiers of many wells of particular interest.

Ground-Water Terminology

The uppermost surface below which geologic materials are saturated under hydrostatic pressure is termed the "water table." Water is stored within spaces between grains or in fractures in the geologic material; the ratio of volume of pore space to total volume of material, expressed as a percentage, is known as "porosity." All geologic materials are porous to some degree. Their ability to transmit water under field conditions is termed "hydraulic conductivity" and depends upon the size of the pore spaces and the degree of their interconnection. Hydraulic

conductivity, as used in this report, is defined as the flow of water in cubic meters per day through a cross-sectional area of geologic material 1 meter thick and 1 meter wide under a hydraulic gradient of 1 meter per meter. "Transmissivity" is also used to indicate the ability of an aquifer to transmit water, and is equivalent to the hydraulic conductivity multiplied by the aquifer thickness in meters. Transmissivity is defined as the flow of water in cubic meters per day through a section of aquifer 1 meter wide under a hydraulic gradient of 1 meter per meter. The volume of water that an aquifer can release from or take into storage per unit surface area of the aquifer per unit change in head is known as "storage coefficient." Storage coefficient and transmissivity are the main characteristics that determine the worth of an aquifer as a source of water. Another term, "specific capacity," defined as the ratio of the rate of well discharge to the drawdown of water level, is used to describe well performance. Under certain assumptions the specific capacity of a well can be theoretically related to the transmissivity of the producing aquifer.

Mine-Area Research Sites

Absaloka Mine

The Absaloka mine (formerly Sarpy Creek Mine) was opened by Westmoreland Resources in 1974 and has since disturbed about 120 hectares of land (Fig. 3). Two coal beds, the Rosebud-McKay and Robinson seams, are being mined. A pre-mining hydrologic study of the area was conducted in 1972 and 1973 by the Montana Bureau of Mines and Geology, and the results were described in an open-file report by Van Voast and Hedges (1974). During the study an observation-well system was established that has since been used for monitoring ground-water conditions

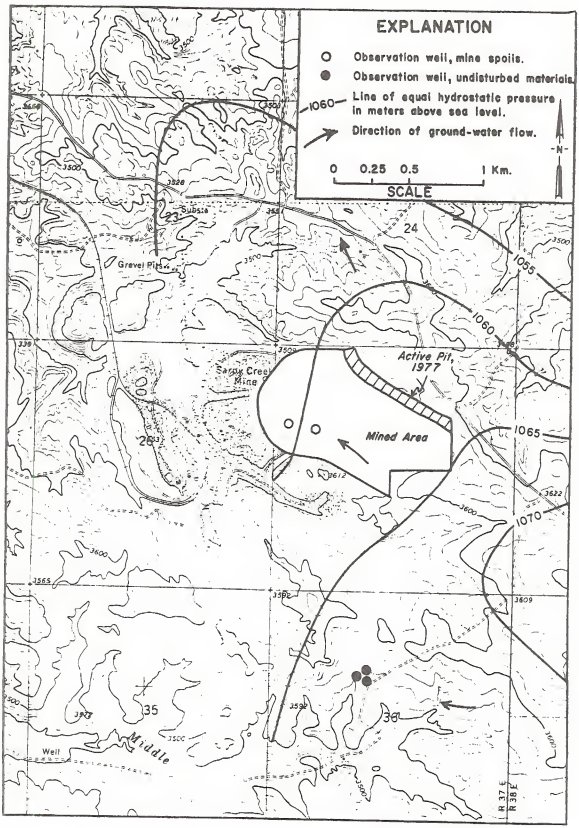


Figure 3.-The Absaloka mine in T. 1N., R. 37E., southeastern Montana.

(APPENDIX A), first by the Montana Bureau of Mines and Geology, and later by Westmoreland Resources.

Ground water in the coal beds and overburden flows northwestward to the mine area (Fig. 3) from recharge areas in uplands southeast of there. Transmissivities of the aquifers were found to be very low, and the rates of ground-water flow are probably also very low. The coal beds here are not highly productive aquifers, but the small amounts of water in the coal and overburden are of the most desirable quality of ground waters in the area. Dissolved-solids concentrations in the coal-bed and overburden waters range from 100 mg/l to 3,000 mg/l; some waters in other aquifers contain as much as 5,000 mg/l, dissolved solids.

The mine has not yet disturbed very much land surface, and only a small area of spoils has thus far been topsoiled and seeded at final contour. Two observation wells have been installed in the reclamation area, and provide some data for this report.

Rosebud Mine

The Rosebud mine (Figs. 4 and 5) has been operated since 1924 except for a 10 year halt between 1958 and 1968. The Rosebud coal bed has been the object of mining that has disturbed about 800 hectares. Hydrologic research has been conducted there by the Montana Bureau of Mines and Geology since 1973. Results of that work have been compiled in a bulletin by Van Voast, Hedges, and McDermott (1977).

Ground water in the Rosebud coal bed flows eastward toward and through the mined area. The coal bed provides generally adequate water supplies to stock and domestic wells and is most heavily utilized where it lies within about 60 meters below land surface. Logically, these areas nearly coincide with areas where the coal bed is economically

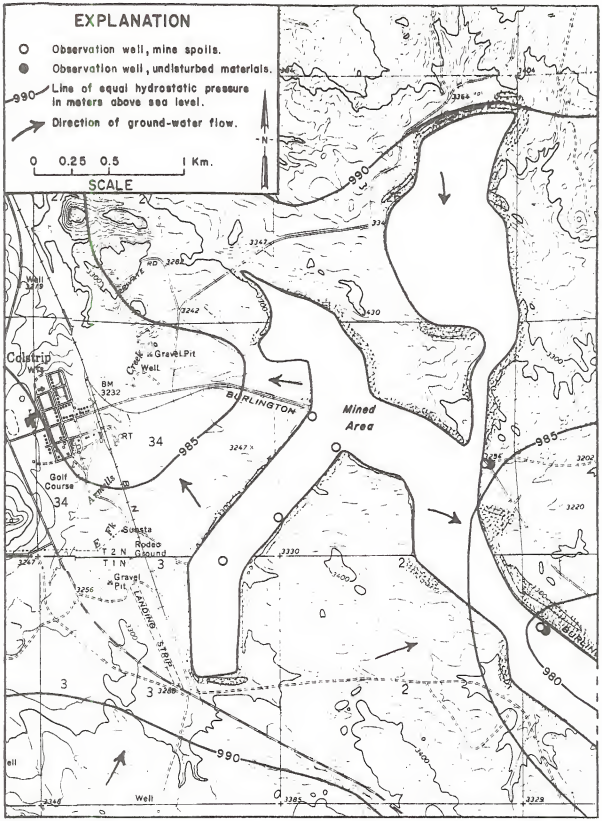


Figure 4.-Northern half of the Rosebud mine in T. 1N., R. 41E., southeastern Montana.

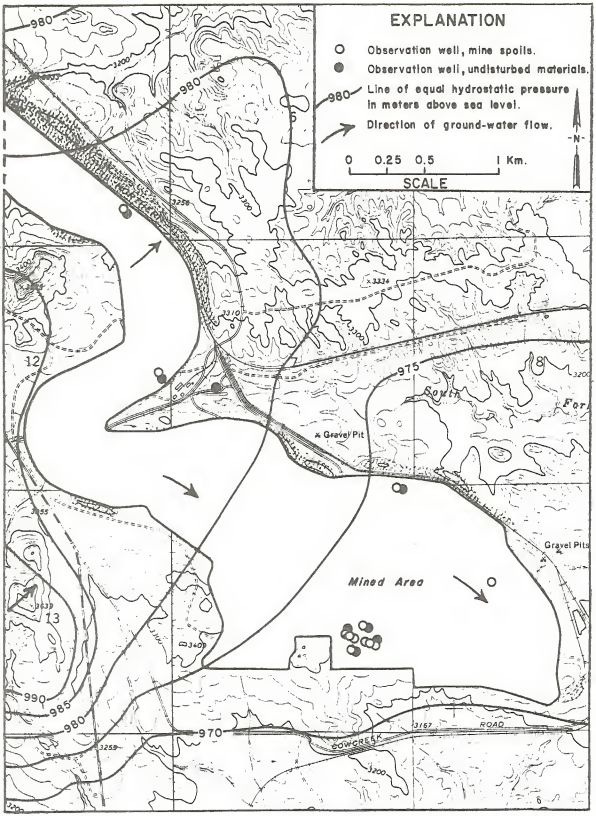


Figure 5.-Southern half of the Rosebud mine in T. 1N., R. 41 and 42E., southeastern Montana.

mineable.

Chemical quality of waters in the Rosebud coal and in other shallow aquifers is diverse. Dissolved-solids concentrations have been found between 400 mg/l and 6,000 mg/l, and the median concentration of 73 analyses was 1,700 mg/l. The waters contain variable proportions of magnesium, calcium, and sodium; most contain high concentrations of sulfate.

During 5 years of monitoring water levels near active Rosebud mining operations, no mining-related changes in water levels have been detected in the aquifers being disturbed (APPENDIX A). Inflow to active pits has only occasionally been of great enough volume to warrant pumping from the Rosebud mine. As pits in the mine have been backfilled, a saturated zone of variable but mostly less than 1-meter thickness has developed in the mine spoils. Near an experimental impoundment, the saturated zone is more than 5 meters thick. Water in the spoils enters laterally from unmined aquifers, and vertically from rainfall and snowmelt, particularly beneath areas of poor surface drainage.

Big Sky Mine

The Big Sky mine (Fig. 6) was opened in 1969, and has since disturbed approximately 350 hectares of land. Hydrologic research of the area has been described in the Montana Bureau of Mines and Geology Bulletin 102 by Van Voast, Hedges, and McDermott (1977). The Rosebud and McKay coal beds are the targets of mining there; they are also aquifers of local significance. This mine is 2½ miles southwest of the Rosebud mine, so geologic and hydrologic conditions around the two are similar. Active pits at the Big Sky mine have induced substantially more ground-water inflow, however, partly because two coal beds are

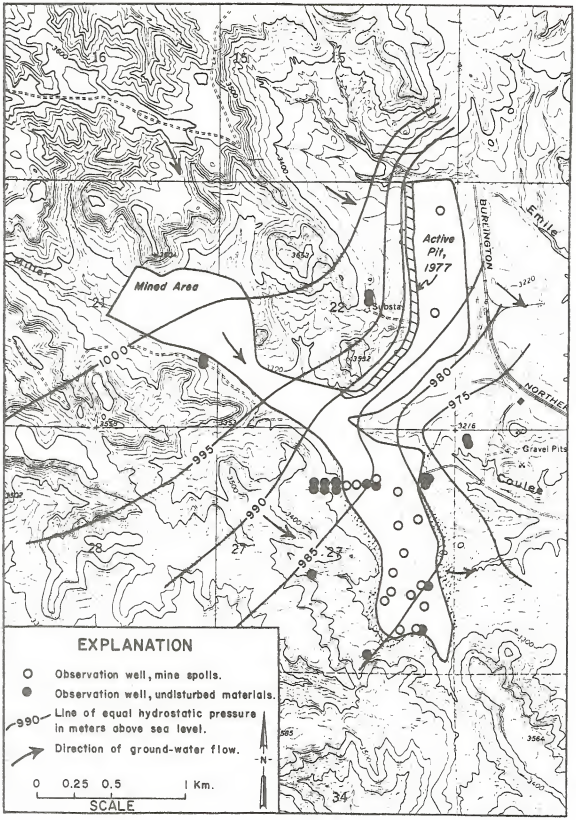


Figure 6.-The Big Sky mine in T. 1N., R. 41E., southeastern Montana.

being mined there. Effluents pumped from the pits are chemical mixtures of local ground waters and have not caused degradation of water quality. Water-level declines in coal-bed aquifers have been as great as 2 meters very close to the active pit (APPENDIX A). More than 1 kilometer from the mine, declines have been less than 1 meter.

As active mining has proceeded northward, a saturated zone as much as 8 meters thick has developed at the spoils' base. Southeastward-flowing ground water enters the spoils from undisturbed aquifers, and is augmented by recharge from an experimental impoundment in the south end of the mined area.

Decker Mine

The Decker mine (Fig. 7) was opened in early 1972 and about 450 hectares of land have since been disturbed. Hydrologic aspects of mining there have been described in the Montana Bureau of Mines Bulletin 97, by Van Voast and Hedges (1975). The Anderson-Dietz 1 coal bed, the object of mining, is an aquifer of large areal significance westward from the mine. This mine is different from others in Montana in terms of geologic and hydrologic conditions. Geologic materials at the Decker mine contain much more sodium than do materials at other mines. Consequently, ground waters in the coal and overburden contain relatively high concentrations of sodium. Sulfate, a major constituent in waters at other mines, is notably absent from water in the coal. Instead, bicarbonate is present in high concentrations, in some places to the degree of over-saturation. Where oversaturated with bicarbonate, the water is somewhat like the artificially carbonated soda water that is marketed commercially. Dissolved-solids concentrations in waters in the coal are uniformly between 1,000 mg/l and 2,000 mg/l, in contrast to the

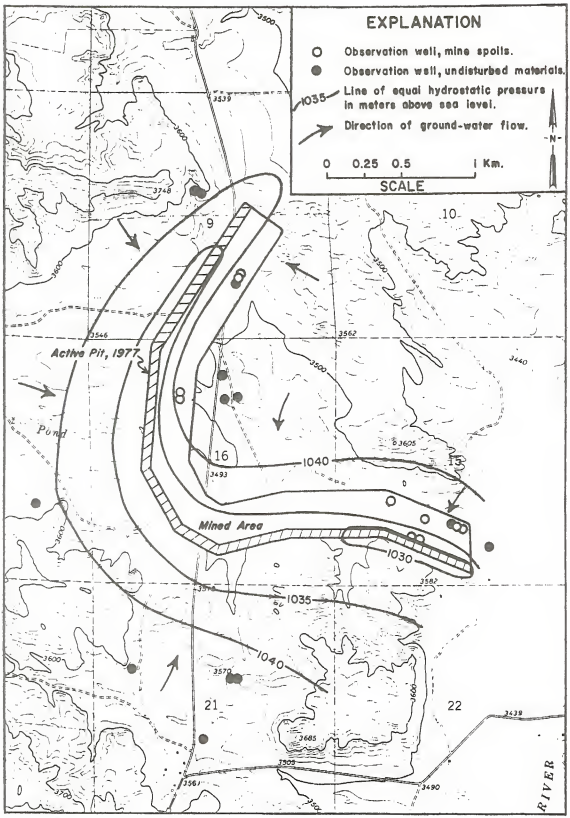


Figure 7.-The Decker mine in T. 9S., R. 40E., southeastern Montana.

diverse and generally higher values for waters in other mine areas.

Another unique hydrologic condition is the presence of the Tongue River Reservoir at the eastern end of the mine. The reservoir and hydrologically connected alluvium form a hydrologic boundary that strongly limits any eastward effects of mining.

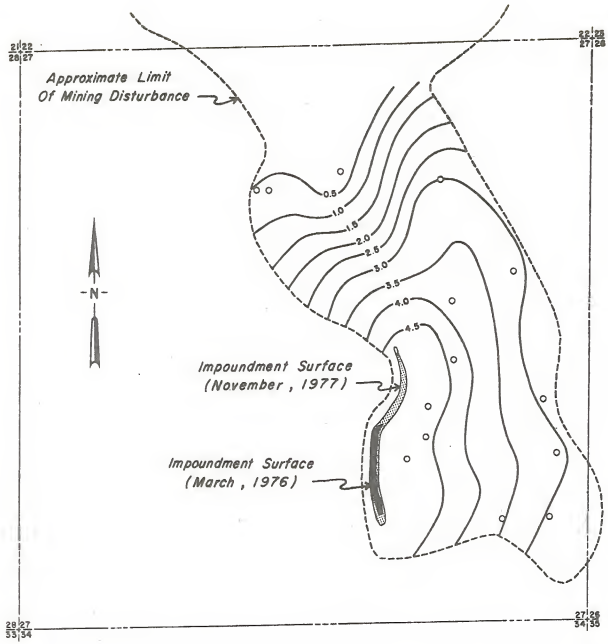
Water levels in research wells around the Decker mine have declined much more than those near other Montana mines. Within 3 kilometers west of the active pit, declines have been more than 3 meters; close to the pit, water levels have declined as much as 25 meters (APPENDIX A). Ground-water inflow to the mine pit has been substantial enough that pumpage to the Tongue River has often been necessary. Introduction of these effluents to the river is an acceleration of naturally occurring ground-water discharge and has not significantly changed the river-water quality.

HYDROGEOLOGIC CONDITIONS IN MINE SPOILS

Ground-Water Levels

In all of the mined areas, ground waters have been re-entering backfilled pits. Water levels in mine spoils were monitored at 43 research wells during the study (APPENDIX B). At the Big Sky mine, saturated thickness of the spoils has increased dramatically near an impoundment (Fig. 8) at the mine's southern end. Effluent from the active pit has been pumped into the experimental impoundment periodically since March 1976. The impoundment, an abandoned mine cut that penetrates the entire thickness of spoils, recharges the ground-water system and has increased the saturated thickness of nearby spoils by more than 4.5 meters.

At the Decker mine, a saturated zone as much as 14-meters thick has



EXPLANATION

2.5 Line of equal ground-water level rise expressed in meters. Contour interval is 0.5 meters.

Data point, spoils observation well.

SCALE

0 100 200 300 400 500 meters

Figure 8.-Increased saturated thickness of mine spoils near an experimental impoundment at the Big Sky mine, southeastern Montana.

developed in the spoils (Fig. 9) as ground waters have reentered the east side of the mine area. Sources of the reentering waters are undisturbed coal and alluvium. The alluvium is in close hydraulic connection with the nearby Tongue River Reservoir in which the stage varies greatly during each year. The changes in reservoir stage are effectively transmitted through the alluvium to the saturated spoils, causing water levels there to fluctuate as much as 2 meters per year.

Hydraulic Conductivity

A major control in the rate that ground water moves into and through geologic materials is hydraulic conductivity. To determine hydraulic conductivity of mine spoils, aquifer tests were conducted at many of the research wells. In all, 23 tests were conducted (Table 1): 8 at the Big Sky mine, 9 at the Rosebud mine, and 6 at the Decker mine. No tests were conducted at the Absaloka mine. Wide ranges of values were found in all mine areas, indicating diverse conditions along the mine floors. Examinations of the mining operations and the mine floors indicate that rubble consisting of boulders and wasted coal is present in many places and that these materials can provide wide variations in hydraulic conductivity. Values at the Rosebud and Decker mines do not appear greatly different, and are more uniform than those found in spoils at the Big Sky mine.

The observed broad ranges of hydraulic conductivity for spoils and coal-bed aquifers are not at all unusual for geologic materials. The hydraulic conductivities of any particular geologic material typically exhibit a lognormal distribution because values of conductivity have a lower bound greater than zero (all geologic materials are conductive to some degree) and an upper bound that, for practical purposes, is

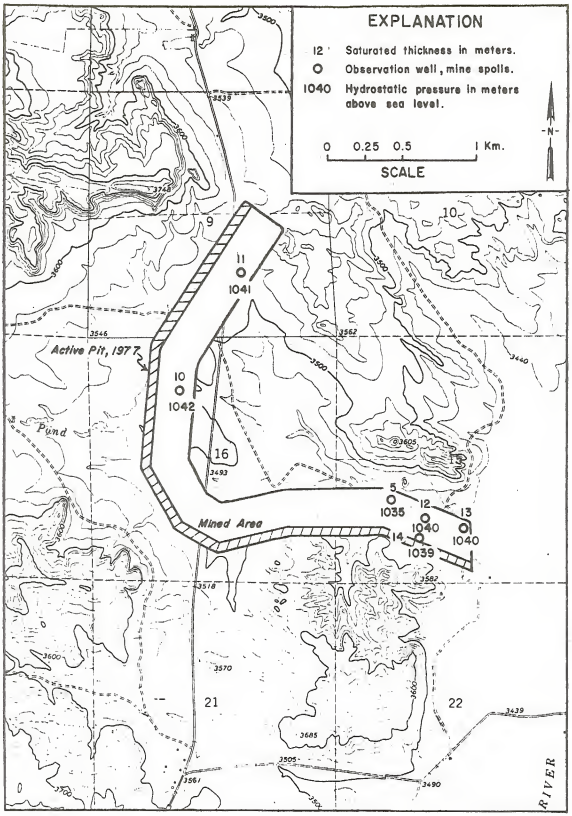


Figure 9.-Saturated spoil thicknesses at the Decker mine, southeastern Montana.

Table 1.-Transmissivity and hydraulic-conductivity values for mine spoils in southeastern Montana.

Mine area	Well location	Well designation	Type of test*	Transmissivity (square meters per day)	Hydraulic conductivity (meters per day)
Big Sky	1N 41E 22DAA	BS-40	Bailer recovery	0.05	0.005
"	1N 41E 27ABCC 3	BS-22	"	.01	.007
"	1N 41E 27ACCC	BS-37	"	.006	.0006
"	1N 41E 27ADCA	BS-36	"	.003	.0003
"	1N 41E 27ADCC	BS-35	Constant discharge	1.58	.08
"	1N 41E 27BADC 3	BS-19	Bailer recovery	0.09	.01
"	1N 41E 27DADC	BS-34	Constant discharge	121.	3.57
"	1N 41E 27DBDC	BS-28	"	291.	19.9
Rosebud	1N 42E 17BDDC	S-2	Bailer recovery	6.00	1.52
"	1N 42E 18DAAB 2	EPA-12	"	1.20	1.40
"	1N 42E 18DAAC 2	EPA-10	"	2.20	1.74
"	1N 42E 18DAAD 2	EPA-2	"	0.03	0.01
"	1N 42E 18DAAD 3	EPA-3	"	2.60	1.04
"	1N 42E 18DAAD 4	EPA-4	"	3.44	1.19
"	1N 42E 18DABD 1	EPA-5	"	0.20	0.07
"	1N 42E 18DABD 2	EPA-6	"	.20	.09
"	1N 42E 18DABD 4	EPA-8	"	.80	.55
Decker	9S 40E 9DCAB 2	DS-5B	Bailer recovery	0.02	0.001
"	9S 40E 15CACD	DS-3	"	8.10	1.06
"	9S 40E 15CBDA	DS-4	"	0.02	0.008
"	9S 40E 15CDBC 1	DS-1A	Constant discharge	12.4	2.55
"	9S 40E 15CDBC 2	DS-1B	"	7.70	1.58
"	9S 40E 15DBCC 2	DS-2B	Bailer recovery	0.003	0.002

*Bailer recovery: analysis with Skibitzke (1958) equation for residual drawdown after multicycle bailing.
Constant discharge: analysis with Jacob (1940) modification of Theis (1935) nonequilibrium equation.

essentially unlimited. The hydraulic conductivities calculated from tests of coal-bed aquifers (APPENDIX C) by the Montana Bureau of Mines and Geology in numerous research areas in southeastern Montana illustrate a typical lognormal distribution (Fig. 10). The linearity of the plotted values indicates that the distribution of hydraulic conductivities in coal may be approximated closely by a lognormal distribution. Lognormal distribution is similarly expected to represent hydraulic conductivities in spoils and in coal beds within smaller areas.

"Mean" and "standard deviation" are two statistical terms used to describe a group of data or a sample set. The mean of a finite sample is defined as the sum of the values divided by the number of values. The standard deviation is defined as the square root of the sum of the deviations squared, where a deviation is the difference between the mean and the sample value, divided by the number of values. Both statistics are useful in describing finite sample populations or a finite, random number of samples from an infinite sample population. In order to make a meaningful comparison between two small sample sets with differing sample sizes, it is necessary to generate estimates of the population statistics based upon the sample statistics. The generated estimates establish an interval around the sample statistic within which the population statistic would be contained with a selected degree of confidence. Ninety-five percent confidence intervals were constructed around the sample means and standard deviations for the following sets of hydraulic conductivity samples (Fig. 11): spoils at the Rosebud and Big Sky mines; coal-bed aquifers within or near the Rosebud and Big Sky mines; spoils at the Decker mine; coal-bed aquifers within or near the Decker mine; and coal-bed aquifers in all areas studied,

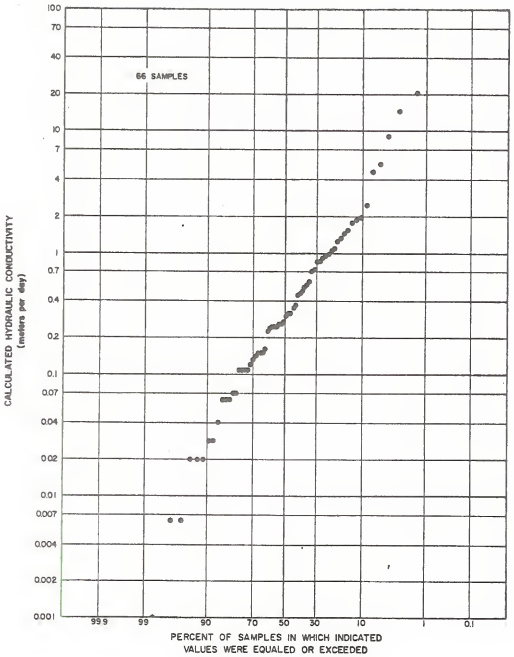


Figure 10.-Statistical distribution of hydraulic-conductivity values from aquifer tests of coal beds in southeastern Montana.

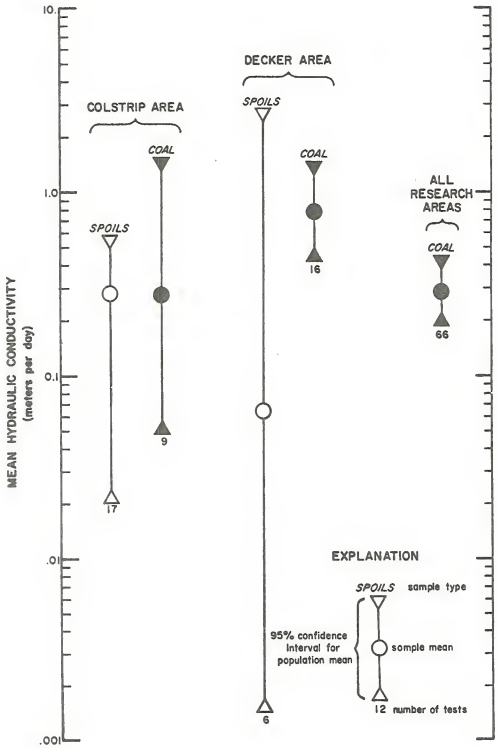


Figure 11.-Sample and population means of hydraulic conductivity for coal and spoils in southeastern Montana.

regardless of proximity to mining activity. The sample means and the confidence intervals for population means are shown on Figure 11. The sample standard deviations and the confidence intervals for the population standard deviations for these sets are shown on Figure 12.

Based upon the statistics illustrated in Figures 11 and 12, and supported by the statistical "t" and "F" tests (tests of means and variance respectively), conclusions regarding hydraulic conductivities in spoils may be made: 1) In the Colstrip area, the spoils exhibit similar characteristics of hydraulic conductivity as the coal which they replace; and 2) In the Decker area, where hydraulic conductivities of the coal aquifers are generally uniform and somewhat higher than in other areas, the spoils have generally lower conductivities that are much more variable than the coal-beds that they replace.

Both the statistical analysis of aquifer-test data, and the directly measured evidence of ground water reentering the mined areas, indicate that mined lands in southeastern Montana do not act as barriers to ground-water flow. The differences between pre-mining and post-mining hydraulic conductivities for existing and future mine areas can vary, depending upon overburden characteristics and mining techniques, but there is no reason to expect permanent blockage of ground-water flow.

Storage Coefficient

Hydraulic conductivity is a necessary parameter for calculations regarding steady-state or natural long-term flow conditions. An additional aquifer characteristic, storage coefficient (a dimensionless ratio), is needed for calculations predicting non-steady-state flows and water levels during relatively short periods such as during well

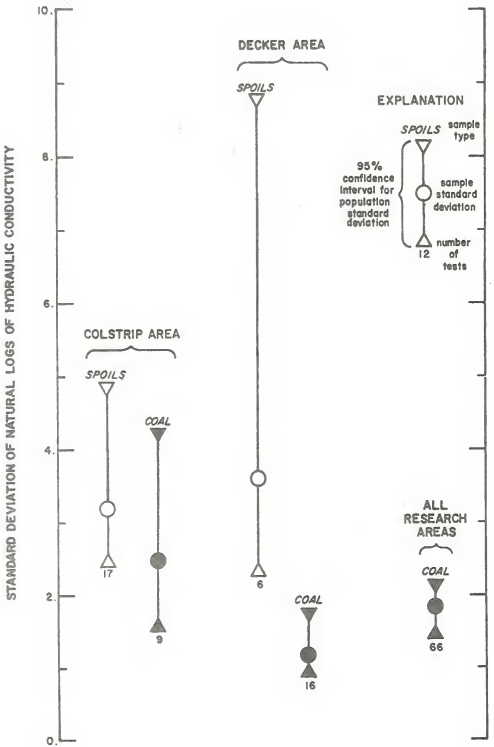


Figure 12.-Sample and population standard deviations of natural logs of hydraulic conductivity for coal and spoils in southeastern Montana.

production or inflow to mine pits. The ratio is also an indicator of the conditions under which water is contained in an aquifer. Where ground water is under pressure greater than atmospheric pressure, storage coefficients commonly range between .01 and .000001. Where ground water occurs under pressures equal to atmospheric pressure, storage coefficients are approximately equal to aquifer porosities expressed as decimals; they generally range between 0.1 and 0.3. To hold water under pressures greater than atmospheric, an aquifer must be confined beneath less permeable material such as clay or silt. The coal-bed aquifers in most places in southeastern Montana are interbedded with clay and silt; when the aquifers are penetrated by wells, waters generally rise in the casings to levels higher than the aquifers, thus indicating the confining conditions. Water levels in these wells also fluctuate as atmospheric pressures change. During periods of lowest atmospheric pressure, water levels stand highest; increased atmospheric pressures push the water levels downward in the wells. When wells are completed in the mine spoils, it is usually not apparent at what depths the most permeable conditions occur or whether water levels rise in the casings.

To learn the mode of containment of ground water in spoils, continuous water-level recorders and a recording barograph were utilized in the mine areas; concurrent water levels and atmospheric pressures were recorded for calculations of storage coefficient. Figure 13, an example of the type of data obtained, shows typical water-level responses to changes in atmospheric pressure. Storage coefficients were estimated from these data, using a method developed by Jacob (1940, p. 583). Jacob's method requires estimates of porosity and aquifer

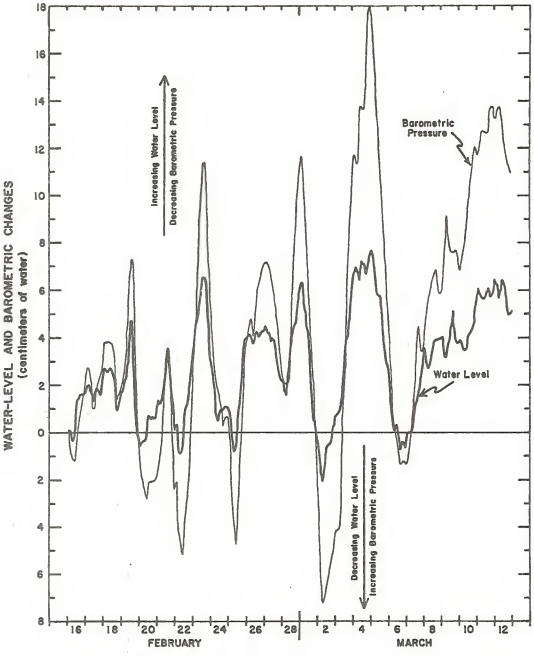


Figure 13.-Example of water-level and barometric changes from which storage coefficients were calculated for mine-spoils aquifers in southeastern Montana.

thickness, neither of which are known for mine spoils. Porosity was assumed to be 25 percent and saturated thicknesses of spoils were used for aquifer-thickness values; in doing the storage-coefficient estimates it was apparent that Jacob's equation is not very sensitive to these estimates. For the 6 wells where adequate data were obtained, the following values of storage coefficient were estimated:

Mine area	Well designation	Storage coefficient
Big Sky	BS-29	.00003
Rosebud	S-01	.00003
Rosebud	S-02	.00001
Decker	DS-03	.00002
Decker	DS-04	.00003
Decker	DS-07B	.00003

The low values of storage coefficient shown above strongly indicate that the mine-spoils aquifers are confined between less permeable strata. All evidence suggests that the most permeable portions of mine spoils occur along the bases of the mine floors where coarse materials such as wasted coal and boulders have been covered with finer-grained geologic meterials.

Both the storage-coefficient data and the hydraulic-conductivity interpretations indicate that the occurrence and flow of ground water in mine spoils is not greatly different from conditions in the undisturbed coal-bed aquifers. In both cases, ground-waters are in aquifers confined between less permeable materials, and the potential rates of flow do not appear dissimilar.

SPOILS-WATER QUALITY

Aspects of water quality in mine spoils are far more complex than those of ground-water flow. Because of the replacement of organic

aquifer material (coal) by clay, silt, and sand, it seems likely that different chemical characteristics will be found in post-mining ground waters.

To examine these differences, laboratory analyses were conducted on many samples of spoils waters from southeastern Montana mines. The waters were analyzed to determine concentrations of major chemical constituents (APPENDIX D), and selected samples were analyzed for trace-element concentrations (APPENDIX E). The water-quality data base also includes analyses of waters from observation wells completed in coal-bed aquifers (APPENDIX F), and analyses of ground waters presently used for stock and domestic supplies (APPENDIX G).

Major Constituents

Strong diversities of chemical types and concentrations occur in spoils waters at the four mines that were studied. Of the principal cations (calcium, magnesium, and sodium), sodium is strongly predominant in Decker spoils waters and is present in only minor concentrations in Rosebud spoils waters. Sodium is predominant in the one analyses of Absaloka mine water and in a few analyses of water from the Big Sky mine. Magnesium and calcium are the predominant cations in analyses of Rosebud spoils water and in most analyses of Big Sky spoils water. Of the principal anions (bicarbonate, sulfate, and chloride), bicarbonate is generally predominant in analyses of Decker spoils water and rarely predominant in analyses of water from the Rosebud, Big Sky, and Absaloka mines.

Comparisons of water quality in mined and non-mined situations indicate that concentrations of major constituents in spoils waters are substantially different from those in the coal beds and that the quality

of spoils water changes temporally.

The best location for a comparison of spoils waters and coal-bed waters is at Decker, where ground water in the coal is known to have a very uniform quality. There, research wells were installed in spoils very near to wells that penetrate the coal. At that locale, water in the spoils contains much more calcium, magnesium, and sulfate than does the water in the coal (Fig. 14). The quality of spoils water there very closely resembles that of water in a local sandstone bed, part of the coal's overburden. At this one location it is not difficult to see the difference between pre-mining and post-mining ground-water quality. When examining larger numbers of samples over larger areas, the differences are very difficult to detect because of extreme water-quality diversity in spoils and in most coal beds.

The temporal variability of spoils-water quality further complicates any description of post-mining conditions. The changes probably occur for several reasons. Saturated thicknesses of spoils in some of the mine areas have not yet attained equillibrium; the changing water levels change the amount of salts available for solution. Complete circulation of ground water through the mined lands has not yet occurred; a uniform areal distribution of dissolved salts has not been established. Combined with these factors is the complex distribution of available salts in the spoils; salt content in overburden is highly diverse, and the diversity can be amplified when the materials are moved during mining. The study of mine-spoils water quality is further complicated by the apparent presence of "mine-floor" aquifers that are more transmissive than the other spoils materials. Analyses of samples from wells probably more reflect water quality in these zones rather than in the entire saturated thicknesses.

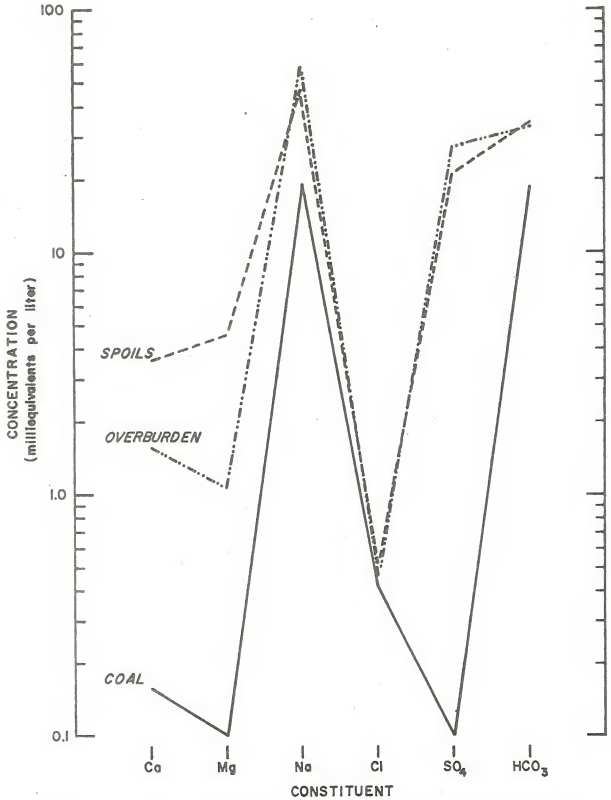


Figure 14.-Chemical comparisons of Decker area ground waters from coal (dissolved solids, 1050 mg/l), overburden (dissolved solids, 3800 mg/l), and spoils (dissolved solids, 3300 mg/l).

The changes that occur in spoils-water quality are different at each mine, and perhaps also different at locales within each mine. At the Rosebud mine, concentrations of dissolved solids in waters from well S-01 have generally increased since 1973 (Fig. 15). Concentrations were erratic through 1975, possibly because of changes in saturated thicknesses. Since 1976, they have been increasing relatively uniformly without any associated changes in saturated thickness.

At the Big Sky mine, concentrations of dissolved solids have apparently not changed greatly at well BS-28 (Fig. 16), although the saturated thickness has increased by about 7 meters since November, 1976. It may be that, here, the sampling reflects quality of water only in the "mine-floor" aquifer rather than that in the entire zone of saturation.

At the Decker mine, water quality was apparently very erratic at wells DS-1B and DS-7B during 1975 and 1976 (Fig. 17). From mid-1976 through mid-1978 the sum of dissolved constituents was more stable, and followed an apparent gradual decreasing trend. The period of relatively erratic water quality occurred while ground water first entered the spoils. After a saturated thickness of about 6 meters had become established, water samples were of more consistent chemical quality. By mid-1978, a saturated thickness of 14 meters was established, and the water quality was not significantly different from that found in late 1976. Waters sampled at the 2 wells (DS-7B was drilled to replace DS-1B when the casing failed in 1977) undoubtedly were from the mine-floor aquifer where most flow occurs, and may not be chemically representative of ground water higher in the saturated zone.

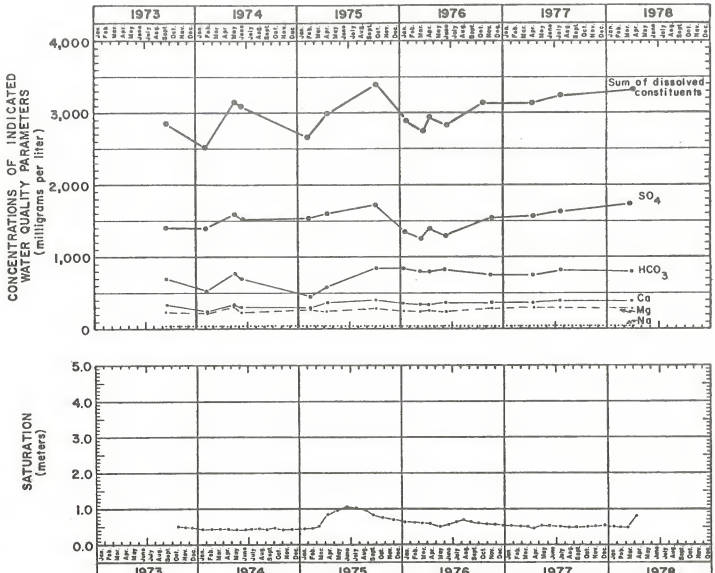


Figure 15.-Changes in saturated thickness and water quality in Rosebud mine spoils (well, S-01), southeastern Montana.

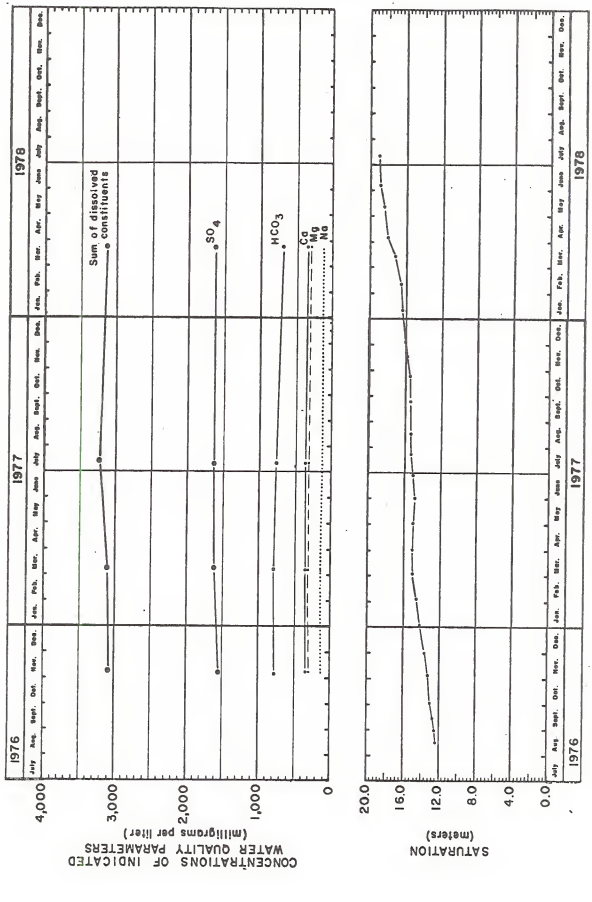


Figure 16.-Changes in saturated thickness and water quality in Big Sky mine spoils (well, BS-28), southeastern Montana.

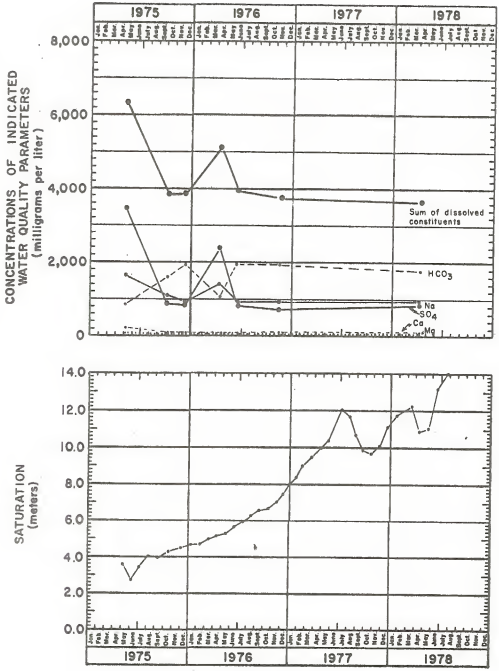


Figure 17.-Changes in saturated thickness and water quality in Decker mine spoils (well, DS-1B, 7B), southeastern Montana.

Comparison With Quality of Other Ground Waters

Significance of the quality of spoils water within the Fort Union Region is difficult to appraise because of the extreme diversity of water quality in the mined areas and throughout the Region. To place spoils-water quality in perspective to other waters of the Region, certain statistics were determined for individual parameters, and were compared for various ground-water sources and uses. The date file for statistical analyses consists of 112 analyses of water from observation wells completed in mine spoils (APPENDIX D), 169 analyses of water from observation wells completed in undisturbed aquifers (APPENDIX F), and 505 analyses of water from stock and domestic wells in the Region APPENDIX G). All of the analyses were conducted by the MBMG (Montana Bureau of Mines and Geology) laboratory, Butte. Water samples from the observation wells were collected by MBMG personnel; those from stock and domestic wells were collected by the U.S. Geological Survey and the MBMG during hydrologic inventories of the Region (Fig. 18).

For the statistical analyses, mean values are used as central statistics and standard deviations are used as measures of variability. The distribution of some parameters within certain sample sets can be approximated by a normal distribution (Table 2). The distribution of most parameters, however, are approximated equally well or better by a lognormal distribution (Table 3) within which most correlation coefficients exceed 0.90. Tables 2 and 3 do not show accurate comparisons between sample sets; the statistics are misleading because of variations in sample sizes, but they do provide a general characterization of the samples in each set.

In order to compare parameter distributions between sets, standard

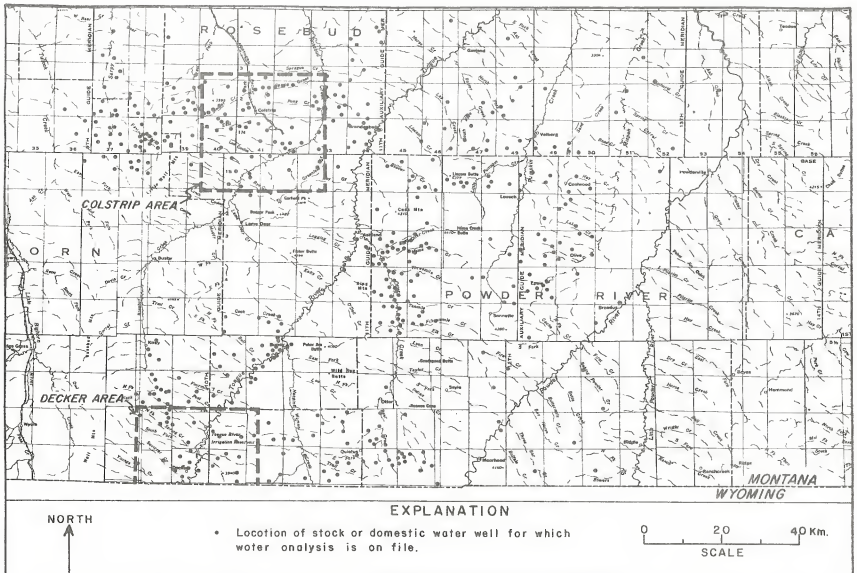


Figure 18.-Outlines of Colstrip and Decker areas, and locations of stock and domestic wells for which water-quality data are available.

Table 2.-Statistical summaries of water quality for various sample sets, assuming a normal distribution of values.

Sample Set	Parameter*								
	CALCIUM	MAGNESIUM	SODIUM	BICARBONATE	SULFATE	CHLORIDE	DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	pH
COLSTRIP SPOILS 74 samples	334. 93.85 .95	344. 149.23 .86	130. 184.61 .65	746. 156.85 .86	1821. 1042.4 .86	22.4 19.41 .88	3051. 1431.8 .86	3395. 1354.2 .87	7.32 .33 .99
COLSTRIP STOCK AND DOMESTIC 57 samples	101. 73.27 .97	122. 90.04 .95	294. 244.97 .96	442. 134.56 .93	981. 598.92 .97	13.3 19.40 .50	1758. 866.09 .98	2299. 997.53 .97	7.90 .44 .89
ALL STOCK AND DOMESTIC (excluding Colstrip) 448 samples	84.5 89.06 .89	93.1 105.45 .88	408. 287.97 .96	662. 355.19 .90	876. 881.34 .92	17.0 26.92 .60	1835. 1201.5 .92	2450. 1361.3 .93	7.96 .51 .93
DECKER SPOILS 37 samples	76.9 126.13 .70	53.1 83.14 .72	792. 371.24 .95	1391. 348.78 .96	931. 1249.4 .83	20.2 16.16 .89	2597. 1818.7 .88	3532. 1969.1 .92	7.76 .57 .97
DECKER STOCK AND DOMESTIC 36 samples	66.2 74.77 .92	80.1 122.93 .78	447. 343.65 .91	882. 520.70 .95	671. 823.62 .89	12.7 8.01 .94	1754. 1138.0 .92	2390. 1353.4 .93	8.09 .61 .96
ALL STOCK AND DOMESTIC (excluding Decker) 469 samples	87.9 88.30 .90	97.7 102.62 .90	391. 280.57 .97	618. 320.42 .89	905. 855.19 .92	16.9 27.07 .59	1832. 1171.3 .92	2436. 1324.5 .93	7.95 .49 .93
ALL STOCK AND DOMESTIC 505 samples	86.4 87.52 .90	96.5 104.16 .89	395. 285.49 .96	637. 344.63 .89	888. 854.32 .92	16.5 26.19 .59	1826. 1168.0 .92	2433. 1325.3 .93	7.96 .50 .93
ALL COAL OBSERVATION WELLS 168 samples	160. 163.22 .95	193. 277.33 .78	343. 286.18 .89	793. 483.74 .93	1208. 1432.4 .83	23.7 29.93 .73	2349. 1813.9 .83	2839. 1629.2 .88	7.83 .54 .95

Key for each sample set: sample mean / standard deviation / correlation coefficient

*Values for constituents, milligrams per liter; specific conductance, micromhos per centimeter; pH, standard units.

Table 3.- Statistical summaries of water quality for various sample sets, assuming a lognormal distribution of values.

Sample Set	Parameter*								
	CALCIUM	MAGNESIUM	SODIUM	BICARBONATE	SULFATE	CHLORIDE	DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	PH
COLSTRIP SPOILS	2.50	2.50	1.90	2.86	3.20	1.21	3.45	3.50	.86
74 samples	.14	.17	.38	.09	.23	.36	.18	.15	.02
	.90	.92	.92	.91	.94	.96	.94	.94	.99
COLSTRIP STOCK AND DOMESTIC	1.83	1.83	2.25	2.63	2.85	.99	3.19	3.32	.90
57 samples	.48	.66	.51	.13	.51	.28	.24	.21	.02
	.93	.85	.97	.97	.76	.90	.97	.97	.87
ALL STOCK AND DOMESTIC (excluding Colstrip)	1.56	1.43	2.45	2.76	2.42	1.00	3.18	3.32	.90
448 samples	.70	.94	.44	.23	1.08	.41	.28	.24	.03
	.97	.95	.93	.94	.87	.91	.99	.98	.92
DECKER SPOILS	1.51	1.34	2.85	3.13	2.38	1.19	3.33	3.49	.89
37 samples	.57	.61	.20	.11	.98	.32	.27	.22	.03
	.98	.98	.98	.98	.94	.99	.97	.98	.98
DECKER STOCK AND DOMESTIC	1.40	1.21	2.50	2.87	2.10	1.02	3.16	3.31	.91
36 samples	.71	.96	.42	.28	1.16	.28	.27	.24	.03
	.99	.99	.95	.98	.95	.99	.97	.97	.96
ALL STOCK AND DOMESTIC (excluding Decker)	1.60	1.50	2.43	2.74	2.49	1.00	3.18	3.32	.90
469 samples	.68	.91	.45	.22	1.02	.41	.27	.24	.03
	.96	.93	.94	.94	.84	.91	.98	.98	.91
ALL STOCK AND DOMESTIC	1.59	1.48	2.43	1.75	1.46	1.00	3.18	3.32	.90
505 samples	.68	.92	.45	.23	1.04	.40	.27	.24	.03
	.96	.94	.94	.94	.85	.91	.98	.98	.92
ALL COAL OBSERVATION WELLS	1.79	1.68	2.39	2.82	2.57	1.16	3.27	3.39	.89
168 samples	.74	.93	.37	.29	1.02	.41	.29	.23	.03
	.98	.97	.98	.94	.87	.98	.97	.97	.94

Key for each sample set: *sample mean of logs of values*
standard deviation of logs of values
correlation coefficient

**Values for constituents, milligrams per liter; specific conductance, microohos per centimeter; pH, standard units.*

statistical tests were employed at a 95-percent level of confidence. Statistical tests of means were performed to compare all sets, assuming all parameters within each set to be normally distributed (Table 4), and then assuming all parameters within each set to be lognormally distributed (Table 5). Inspection of Tables 4 and 5 yields numerous statistical differences between sets, some of which are meaningful and some others that are not; none of them are particularly unexpected because of the known diversity of ground-water quality.

For perspective, the quality of waters from undisturbed aquifers in the Colstrip and Decker areas are first compared with those in the rest of the Region. From Tables 4 and 5, stock and domestic wells in the Colstrip area produce waters containing statistically higher concentrations of calcium, magnesium, and sulfate than do other wells in the Region, but dissolved-solids contents are not statistically higher. Stock and domestic wells near Decker produce waters that have higher bicarbonate and lower sulfate concentrations than the regional waters, although dissolved solids contents are not statistically higher.

Comparisons in the tables are also made between qualities of water from coal observation wells and those from stock and domestic wells. In most cases, specific-constituent and dissolved-solids concentrations in the stock and domestic supplies are statistically lower than those in waters from the observation wells. Ranchers drill wells for stock and domestic supplies and try to obtain the best quality of water that is possible; research wells were not installed with regard for water quality.

The lack of research-well bias toward water quality suggests that comparisons of spoils-water quality with coal-observation-well water

Table 4.-Statistical comparisons of ground-water qualities representing various sources and areas in southeastern Montana, based upon normal distributions of values. Comparisons are "sample sets A" vs. "sample sets B"; statistically higher mean values indicated by (+), lower mean values by (-), no statistical difference by (0).

Sample Set A	Parameter									Sample Set B
	CALCIUM	MAGNESIUM	SODIUM	BICARBONATE	SULFATE	CHLORIDE	DISSOLVED SOLIDS	PH	SPECIFIC CONDUCTANCE	
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	COLSTRIP STOCK AND DOMESTIC
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	ALL STOCK AND DOMESTIC (excluding Colstrip)
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	ALL STOCK AND DOMESTIC
COLSTRIP SPOILS	+	+	-	0	+	0	+	-	+	ALL COAL OBSERVATION WELLS
COLSTRIP SPOILS	+	+	-	-	+	0	0	-	0	DECKER SPOILS
DECKER SPOILS	0	0	+	+	-	+	+	-	+	DECKER STOCK AND DOMESTIC
DECKER SPOILS	0	-	+	+	0	0	+	-	+	ALL STOCK AND DOMESTIC (excluding Decker)
DECKER SPOILS	0	-	+	+	0	0	+	-	+	ALL STOCK AND DOMESTIC
DECKER SPOILS	-	-	+	+	0	0	0	0	+	ALL COAL OBSERVATION WELLS
COLSTRIP STOCK AND DOMESTIC	0	+	-	-	0	0	0	0	0	ALL STOCK AND DOMESTIC (excluding Colstrip)
COLSTRIP STOCK AND DOMESTIC	-	-	0	-	-	-	-	0	-	ALL COAL OBSERVATION WELLS
DECKER STOCK AND DOMESTIC	0	0	0	+	0	-	0	0	0	ALL STOCK AND DOMESTIC (excluding Decker)
DECKER STOCK AND DOMESTIC	-	-	0	0	-	-	-	+	0	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC (excluding Colstrip)	-	-	+	-	-	0	-	+	-	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC (excluding Decker)	-	-	0	-	-	-	-	+	-	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC	-	-	0	-	-	-	-	+	-	ALL COAL OBSERVATION WELLS
COLSTRIP STOCK AND DOMESTIC	+	0	-	-	0	0	0	0	0	DECKER STOCK AND DOMESTIC

Table 5.-Statistical comparisons of ground-water qualities representing various sources and areas in southeastern Montana, based upon lognormal distributions of values. Comparisons are "sample sets A" vs. "sample sets B"; statistically higher mean values indicated by (+), lower mean values by (-), no statistical difference by (0).

Sample Set A	Parameter									Sample Set B
	CALCIUM	MAGNESIUM	SODIUM	BICARBONATE	SULFATE	CHLORIDE	DISSOLVED SOLIDS	PH	SPECIFIC CONDUCTANCE	
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	COLSTRIP STOCK AND DOMESTIC
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	ALL STOCK AND DOMESTIC (excluding Colstrip)
COLSTRIP SPOILS	+	+	-	+	+	+	+	-	+	ALL STOCK AND DOMESTIC
COLSTRIP SPOILS	+	+	-	0	+	0	+	-	+	ALL COAL OBSERVATION WELLS
COLSTRIP SPOILS	+	+	-	-	+	0	+	-	0	DECKER SPOILS
DECKER SPOILS	0	0	+	+	0	+	+	-	+	DECKER STOCK AND DOMESTIC
DECKER SPOILS	0	0	+	+	0	+	+	-	+	ALL STOCK AND DOMESTIC (excluding Decker)
DECKER SPOILS	0	0	+	+	0	+	+	-	+	ALL STOCK AND DOMESTIC
DECKER SPOILS	-	-	+	+	0	0	0	0	+	ALL COAL OBSERVATION WELLS
COLSTRIP STOCK AND DOMESTIC	+	+	-	-	+	0	0	0	0	ALL STOCK AND DOMESTIC (excluding Colstrip)
COLSTRIP STOCK AND DOMESTIC	0	0	0	-	+	-	-	0	-	ALL COAL OBSERVATION WELLS
DECKER STOCK AND DOMESTIC	0	0	0	+	-	0	0	0	0	ALL STOCK AND DOMESTIC (excluding Decker)
DECKER STOCK AND DOMESTIC	-	-	0	0	-	-	-	+	0	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC (excluding Colstrip)	-	-	0	-	0	-	-	+	-	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC (excluding Decker)	-	-	0	-	0	-	-	+	-	ALL COAL OBSERVATION WELLS
ALL STOCK AND DOMESTIC	-	-	0	-	0	-	-	+	-	ALL COAL OBSERVATION WELLS
COLSTRIP STOCK AND DOMESTIC	+	+	-	-	+	0	0	0	0	DECKER STOCK AND DOMESTIC

quality would give the most meaningful perspective of post-mining conditions in the regional system. In the Colstrip area, spoils waters contain higher concentrations of calcium, magnesium, sulfate, and dissolved solids than do regional coal-bed waters; sodium concentrations are statistically lower. Calculated theoretical mean dissolved-solids concentrations (95-percent confidence) in the Colstrip-area spoils waters are 590 mg/l (milligrams per liter) to 1370 mg/l higher than those in waters from undisturbed coal beds of the Region. At Decker, the spoils waters contain statistically higher concentrations of sodium and bicarbonate, and lower concentrations of calcium and magnesium than waters in coal beds throughout the region; sulfate and dissolved-solids concentrations are not statistically different.

Diversity of water quality between mine areas is shown by comparing spoils-water quality at Colstrip with that at Decker. At the Rosebud and Big Sky mines near Colstrip, concentrations of calcium, magnesium, sulfate, and dissolved solids are statistically higher; sodium and bicarbonate concentrations are higher in spoils waters at Decker. The predominance of particular constituents at either mine area reflect geochemical conditions in overburden, primarily the types and amounts of salts available for dissolution, and the nature of exchange reactions with clays.

Some additional comparisons made on Tables 4 and 5 are those between qualities of spoils-waters and those of waters at nearby stock and domestic wells. Areas outlined in Figure 18 were selected for these comparisons. At Colstrip, waters in the spoils contain statistically higher concentrations of calcium, magnesium, bicarbonate, sulfate, and dissolved solids than do the nearby stock and domestic wells.

Theoretical mean dissolved-solids concentrations are 820 mg/l to 1800 mg/l higher in the spoils waters than those in nearby stock and domestic supplies. At Decker, the spoils waters contain higher concentrations of sodium, bicarbonate, and dissolved solids than do the local water supplies. Theoretical mean dissolved-solids concentrations in the spoils waters are 540 mg/l to 860 mg/l higher than those in nearby stock and domestic supplies. These statistical differences do not preclude the useability of spoils waters for water supplies, however. Their chemical diversity is such that many of them have as acceptable qualities as have the waters from undisturbed aquifers.

Trace Elements

Analyses of trace-element concentrations were conducted on selected water samples collected from the spoils (APPENDIX E). Samples were collected and preserved in accordance with U.S. Geological Survey (1972) recommended methods and were analyzed using procedures recommended by the U.S. Environmental Protection Agency (1974). A brief summary of the trace-element concentrations along with some general comments on their significance are outlined below:

Aluminum (Al) - Most concentrations at the Rosebud and Big Sky mines were less than 0.05 mg/l. At Decker, concentrations were generally higher; the maximum concentration was 0.77 mg/l, not enough to have significance. In a literature search, Gough and Shacklette (1976) found suggestions that at least 1 mg/l of aluminum is required to depress the most sensitive vegetation. No quantitative data are available regarding effects of human consumption.

Antimony (Sb) - Most concentrations were less than 0.20 mg/l. The maximum concentration was 3.6 mg/l. No information was found describing antimony toxicity to plants. There is no known effects on humans from antimony in drinking water (U.S. Environmental Protection Agency, 1973).

Arsenic (As) - Four samples of ground water from mine spoils contained detectable concentrations of arsenic; three were from Decker spoils. The highest concentration was 38 µg/l. The U.S. Public Health Service (1962) has established a limit of 50 µg/l for arsenic permissible in public drinking water.

Beryllium (Be) - All concentrations were less than 5 µg/l. There are no known effects of beryllium in water; it is normally insoluble (U.S. Environmental Protection Agency, 1973).

Boron (B) - The maximum concentration was 1.23 mg/l. Concentrations were generally higher at the Rosebud and Big Sky mines than at Decker. Some plants such as citrus trees are sensitive to waters having concentrations greater than 1.0 mg/l (Wilcox, 1955), but crops such as alfalfa are far more tolerant.

Cadmium (Cd) - All concentrations were 0.03 mg/l or lower. Gough and Shacklette (1976) found reports in the literature describing depressed growth of plants receiving as little as 0.2 mg/l cadmium in nutrient solutions. The U.S. Public Health Service (1962) has established a limit of 0.01 mg/l cadmium allowable in public drinking water.

Chromium (Cr) - One sample from Big Sky spoils contained .06 mg/l. Other concentrations were 0.03 mg/l or less. References listed by Gough and Shacklette indicated that chromium is one of the least toxic trace

metals to man. The U.S. Public Health Service permissible limit is 0.05 mg/l chromium in drinking water.

Copper (Cu) - All concentrations were 0.05 mg/l or less except one anomalous value (0.13 mg/l); little significance is attributed to the lone high concentration. The U.S. Public Health Service recommended limit for copper in drinking water is 1.0 mg/l. Copper is far more toxic to fish than to human beings, and its toxicity depends upon other chemical characteristics of the water.

Iron (Fe) - Concentrations as high as 5.1 mg/l were found, although most were less than 1.0 mg/l. The U.S. Public Health Service recommended limit is 0.3 mg/l in public drinking water.

Lead (Pb) - Most concentrations listed in APPENDIX E exceed 0.05 mg/l, which is the mandatory public drinking water limit established by the U.S. Public Health Service. Of the higher concentrations (0.1 mg/l to 0.21 mg/l), most are associable with ground waters in Rosebud and Big Sky mine spoils. *During the research for this report, some questions have arisen regarding the dependability of analytical methods for determining lead and other trace-metal concentrations in alkaline or saline waters. The values presented here were found by conventional flame atomic absorption methods utilizing deuterium-arc background corrections. Other techniques such as plasma-emission spectrophotometry and chelation extractions have been indicating very different (generally lower) concentrations, particularly in Colstrip-area waters. Laboratories of the U.S. Environmental Protection Agency and the U.S. Geological Survey have also become aware of these discrepancies and are examining the analytical techniques. The values in this*

report are presented because they were determined by a currently recommended method even though its dependability has recently become suspect.

Lithium (Li) - Concentrations in Rosebud and Big Sky spoils waters ranged between 0.02 mg/l and 0.09 mg/l; at Decker they ranged between 0.07 mg/l and 0.54 mg/l. The values seem to be far less than any that may be toxic (discussed by Gough and Shacklette, 1976) to vegetation or to animals.

Manganese (Mn) - Many concentrations were found that exceed 1.0 mg/l; most high concentrations were in waters from Rosebud and Big Sky spoils. The U.S. Public Health Service recommends that public drinking water contain less than 0.05 mg/l manganese. Gough and Shacklette report that the form of manganese found in nature (divalent) has a low order of toxicity to living organisms, especially to vertebrate animals.

Mercury (Hg) - The highest concentration was 0.6 µg/l. Mercury, particularly in organic form, can be highly toxic to all animals. The U.S. Environmental Protection Agency (1975) has set a permissible concentration of 2.0 µg/l for public drinking water.

Nickel (Ni) - The maximum concentration was 0.15 mg/l. A rough positive correlation between concentrations of nickel and lead is apparent. Nickel is not a very toxic trace element; there has been no known toxicity to human beings from nickel in drinking water (U.S. Environmental Protection Agency, 1973).

Phosphate (PO_4) - The highest concentration was 0.75 mg/l (as phosphorus). Four of the 58 values exceeded 0.10 mg/l; most were less than 0.05 mg/l. In concentrations found in water, phosphorus is not

reported to be toxic to man, other animals, or fish, but the element does stimulate the growth of algae which can be a problem in surface waters.

Selenium (Se) - Almost all concentrations were less than 5.0 µg/l. A mandatory concentration limit of 10 µg/l selenium in public drinking water has been established by the U.S. Public Health Service (1962).

Silver (Ag) - Concentrations in all samples were 0.01 mg/l or less. The U.S. Public Health Service limit is 0.05 mg/l in drinking water.

Strontium (Sr) - Concentrations ranged between 0.03 mg/l and 15.0 mg/l. No strontium toxicity to animals or vegetation is mentioned in the literature.

Tin (Sn) - Tin was detectable in most samples; range of concentrations was 0.05 mg/l to 4.88 mg/l. There are no substantiated reports in the literature of tin toxicity of plants; animals are seemingly tolerant of high concentrations in food or water (Gough and Shacklette, 1976).

Zinc (Zn) - All but one sample contained less than 1.0 mg/l. The anomalous high value (10.8 mg/l) was found in Absaloka spoils water; a later sample from the same well (analyzed too late for tabulation) contained 0.38 mg/l, however. The U.S. Public Health Service recommended limit for zinc content in drinking water is 5.0 mg/l.

Trace elements in mine-area waters are certainly detectable, but their concentrations are not alarmingly high. Comparison of lead contents in spoils waters and other waters near Colstrip suggests that

somewhat more dissolved lead is present in the Rosebud and Big Sky spoils there. The differences do not appear significant, however, and because of current doubts over the adequacy of analytical techniques, the apparent differences may not be real.

PREDICTING POST-MINING WATER QUALITY

It has been established that ground waters in mine spoils are different (in varying degrees) from waters in the coal beds. Predictions of water quality that would result within spoils in potential mine areas would be helpful. A predictive capability would permit meaningful determinations of impacts of mining on local ground-water quality, and would allow evaluations of alternative spoiling techniques and mining plans.

During this study, leaching tests to simulate field conditions were conducted in the laboratory; distilled and field waters and a variety of spoils materials were used. Attempts were made to determine the amount of readily soluble salts in the spoils, and to identify the effects of flow rates and distances upon the qualities of leachates. The spoils materials were contained within vertical plexiglass columns, each having an overall height of 73 centimeters and an inside diameter of 5 centimeters. The threaded tops of the columns were fitted with sealable caps which permitted pressurization for the maintenance of constant hydrostatic pressures. The leachates were collected through valves at the lower ends of the columns for determinations of water-quality characteristics. In all tests, resulting leachate qualities were found to be similar to qualities of spoils waters sampled in the field. Rates of dissolution were rapid in all of the experiments; specific-conductance values for leachates were linear functions of the

logarithms of cummulative volumes of leachate, with slopes and intercepts dependent upon amounts and types of spoil materials. Spoils materials from the Decker mine contained such large volumes of expanding clays that leach tests could not be conducted. Experiments of leaching Big Sky mine spoils with distilled water and with water from undisturbed coal beds (Fig. 19) gave typical results for the Colstrip area. Using both types of leach water, specific conductance of the leachates decreased rapidly early in the experiments, and progressively more gradually as flow-through continued. Sulfate was the predominant anion being dissolved throughout the tests. Magnesium and sodium were rapidly removed at originally high but gradually decreasing rates; calcium dissolved at relatively constant but slightly increasing rates. At the conclusion of the leaching experiments, calcium and sulfate were by far the predominant salts being dissolved. Had the experiments been continued, the dissolved-solids concentrations probably would have become very similar to those of the input waters. Calcium concentrations in the leachates were strikingly consistent relative to the concentrations of other major ions. Calcium appears to have a saturation plateau between about 25 meq/l (milliequivalents per liter) and 30 meq/l. Some suppression of calcium dissolution seems apparent when other ions are present in high concentrations. Magnesium and sodium concentrations exceeded those of calcium in the first one or two pore volumes of leachate and then rapidly decreased. Sulfate was the predominant anion in all of the leachates, and its concentrations seemed dependent on the availability of cations for dissolution.

Results of the leaching experiments, when expressed as milliequivalents of salts (Fig. 20) show the relative volumes of dissolved salts

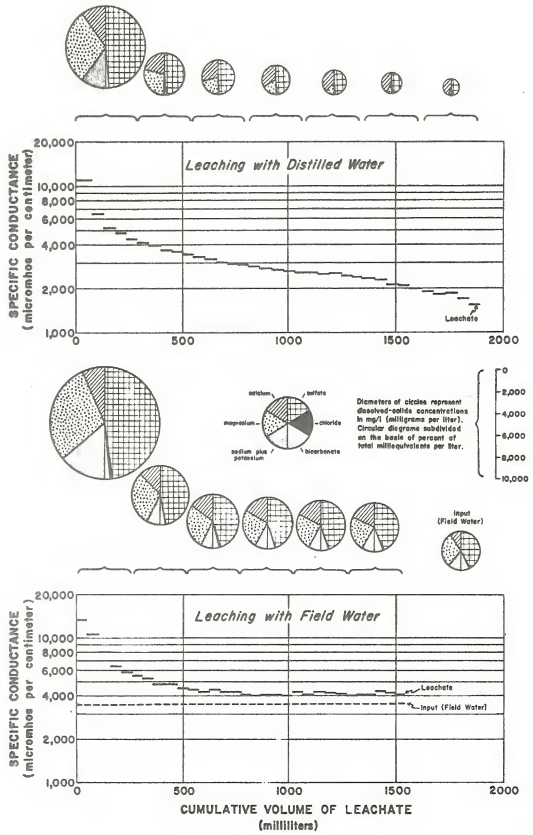


Figure 19.-Examples of spoil leaching experiments using distilled water (specific conductance, 10 micromhos per centimeter) and ground water collected in the field (specific conductance, 3530 micromhos per centimeter).

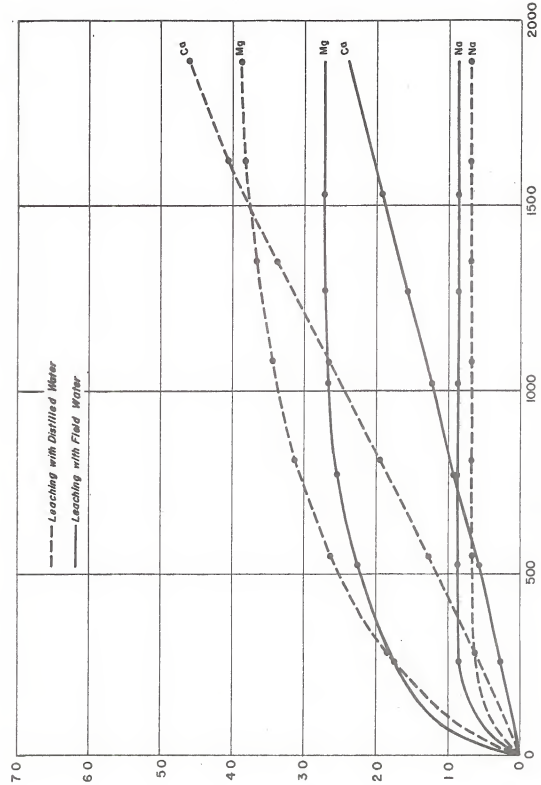


Figure 20.-Example of cumulative salts leached, using distilled water and ground water collected in the field.

and rates of dissolution in distilled and field leach waters. Field waters did not leach salts as rapidly as did distilled water, probably because saturation plateaus were reached. After one pore volume of either leachate (about 300 milliliters) had passed, almost all of the available sodium and about half the available magnesium had been removed. Dissolution of calcium continued at relatively constant rates throughout the tests, and was about twice as rapid in distilled water as in field water.

The rapidity of dissolution of magnesium, sodium, and sulfate in the leaching experiments suggests that they occur in the spoils as highly soluble salts; the simplest possibility is that they occur as magnesium sulfate and as sodium sulfate. Other workers have hypothesized reactions such as oxidation of pyrite, dissolution of calcite, dolomite, and gypsum, and exchange of calcium and magnesium for sodium on clays to generate spoils waters containing high concentrations of magnesium, sodium, and sulfate. These reactions are probably correctly hypothesized, although they do not necessarily occur during the process of leaching. The almost immediate dissolution of high concentrations of the salts from southeastern Montana spoils and overburden implies that pyrite oxidation and cation exchange have probably already occurred sometime in the geologic past, and that the reaction products are presently available in highly soluble forms.

Leaching experiments conducted on overburden or spoils provide some indications of the availability of salts that might influence post-mining ground-water quality. Such experiments are expensive and slow, however, and would not be very practical for pre-mining studies. An alternative approach would be the use of saturated-paste extract

chemistry. These analyses are already required by Montana and other western states during pre-mining planning for revegetation purposes; application of the data to hydrologic studies would be an additional benefit.

To examine the applicability of saturated-paste extract data for spoils-water-quality predictions, several spoil samples were submitted for analysis at a local laboratory (Northern Testing Laboratories, Billings, Montana) that does much of this work for the coal industry. Objectives were to compare analyses of paste extracts with those of leachates, and to examine the sensitivity of paste-extract analyses to differences in spoil-water ratios.

For comparisons with leach analyses, paste-extract analyses were conducted on samples that were split from spoils tested in the leach experiments. Concentrations of major ions in the paste extracts were found to be very similar to those occurring in the first pore-volumes of leachates. Figure 21 is an example of the degree of similarity that was found. The extract and leachate analyses were very comparable for materials from the Rosebud and Big Sky mines, but no data were obtained from the poorly permeable Decker spoils.

Preparation of saturated pastes is a standard technique described by the U.S. Salinity Laboratory Staff (1954). A potential variable between different laboratories or analysts preparing the pastes is the somewhat subjective determination of saturation. To examine the sensitivity of extract chemistry to moisture percentage, three samples were sent to a commercial laboratory for preparation and extract-analysis at saturated levels and at obviously over-saturated levels (Fig. 22). Oversaturation produced lower specific-conductance values than those

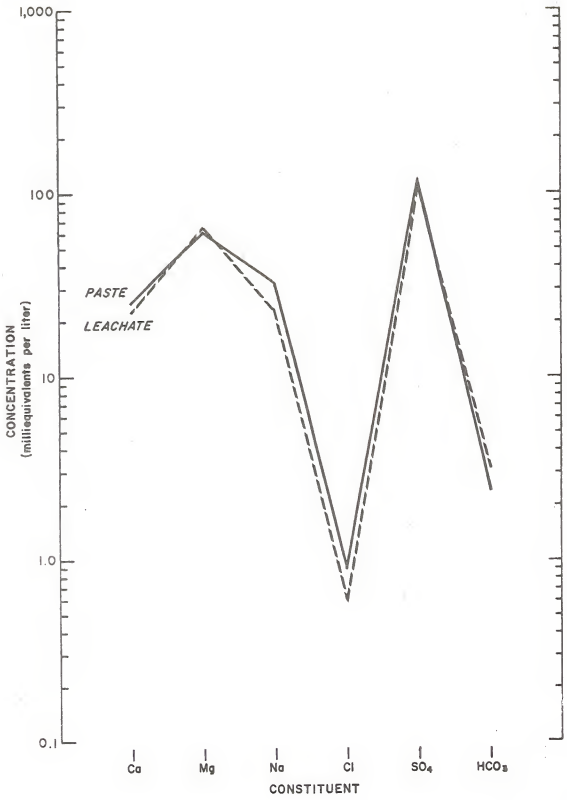


Figure 21.-Example comparison of saturated-paste-extract quality with column leachate quality (one pore volume) for sample splits of Big Sky mine spoils, southeastern Montana.

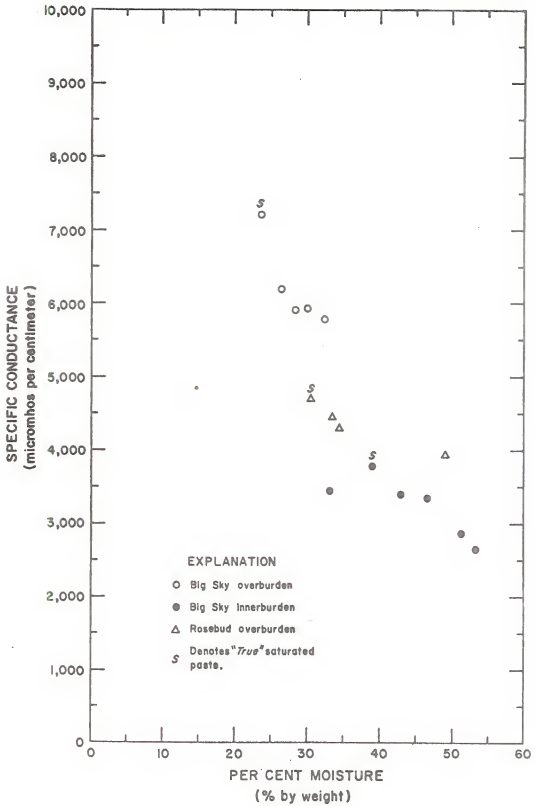


Figure 22.-Specific-conductance values for paste extracts at various degrees of saturation.

for saturated conditions. The differences were such that oversaturation by 10 percent produced specific-conductance values as much as 15 percent lower than those for saturated conditions. Although extract chemistry appears sensitive to moisture percentage, the specific conductances values for any level of saturation shown on Figure 22 would at least provide a general indication of available soluble salt that might influence post-mining water quality.

The many analyses of saturated-paste extracts from Montana mine areas are so diverse that no simple characterization of salt availability is likely. It is not surprising that spoils waters vary so greatly within the Region and within a particular mine area; the materials contributing the soluble salts have an equal or greater diversity. Overburden materials contain such a wide range of soluble-salt concentrations that statistical methods were considered appropriate to compare saturated-paste data with observed spoils-water quality.

Spoils-water and extract quality are most abundant for the Big Sky and Decker mines. At the Big Sky mine, magnesium is the predominant cation in the overburden paste extracts (Fig. 23), occurring in concentrations over the wide range between 0.6 meq/l (milliequivalents per liter) and 700 meq/l. Calcium and sodium also occur over wide ranges; lognormal mean concentrations of the cations are between 3.0 meq/l and 10 meq/l. At Decker, sodium is the predominant cation in the overburden, occurring in concentrations between 3.5 meq/l and 120 meq/l; lognormal mean concentration is 10.5 meq/l. There, calcium and magnesium occur in wide ranges of concentrations but lognormal mean values are less than 0.5 meq/l.

In comparison, observed concentrations of cations in spoils waters

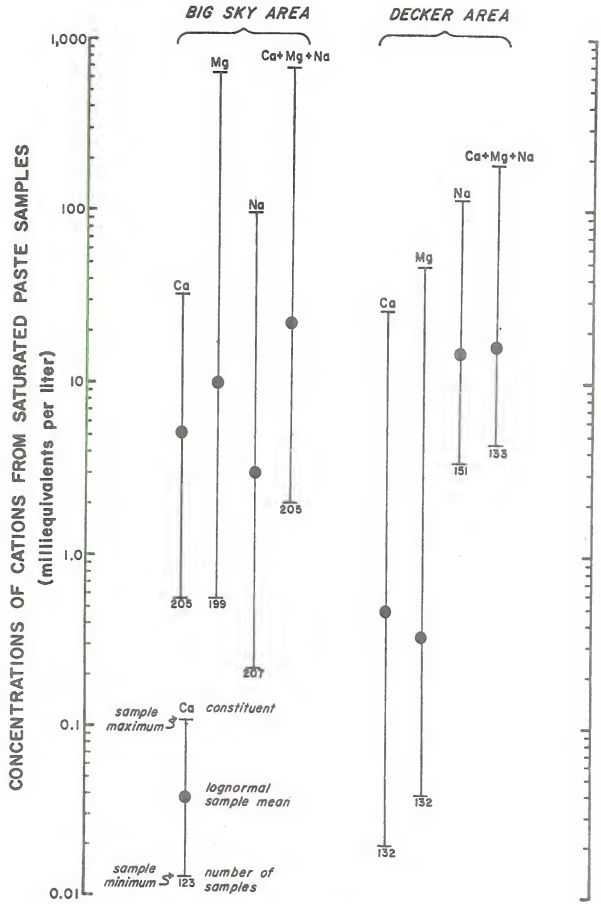


Figure 23.-Ranges and lognormal mean values of cation concentrations in saturated-paste extracts from Big Sky and Decker overburden materials, southeastern Montana.

at the two mines fall in generally narrower ranges than those in the extracts, and lognormal mean values are 2- or more-times higher (Fig. 24). Despite these differences, the relative proportions of individual constituents, as reflected by lognormal means, are very similar. That is, for each mine area, the ratios among calcium, magnesium, and sodium concentrations in paste extracts are similar to those found in waters from the spoils.

Statistical manipulation of the data (Fig. 25 and 26) show predictable ranges within which mean values would fall, based upon idealized sample populations with 95 percent confidence. Here also, there is an apparent relationship between cations in paste extracts and those in waters sampled from spoils aquifers. Extremes of the ranges in Figures 25 and 26 were used to generate a series of nomographs relating the two types of analytical data (Figs. 27, 28, and 29). From the nomographs, ranges of probable lognormal mean concentrations of calcium, magnesium, and sodium can be predicted for spoils waters in proposed mine areas where saturated-paste-extract analyses have been conducted on overburden. At present, only two mine areas exist where spoils-water quality and paste analyses are available, so the only statistically justifiable correlation that can be made is a linear one. As more data become available from these and other mines, the ranges of the estimates will decrease and the predictions will become more precise. From a predictive point of view, it is fortunate that the predominance of individual cations at Big Sky and at Decker are very different; they cover a wide range of concentrations that might be expected in spoils waters within the Region.

Use of the nomographs is best illustrated by an example. Consider

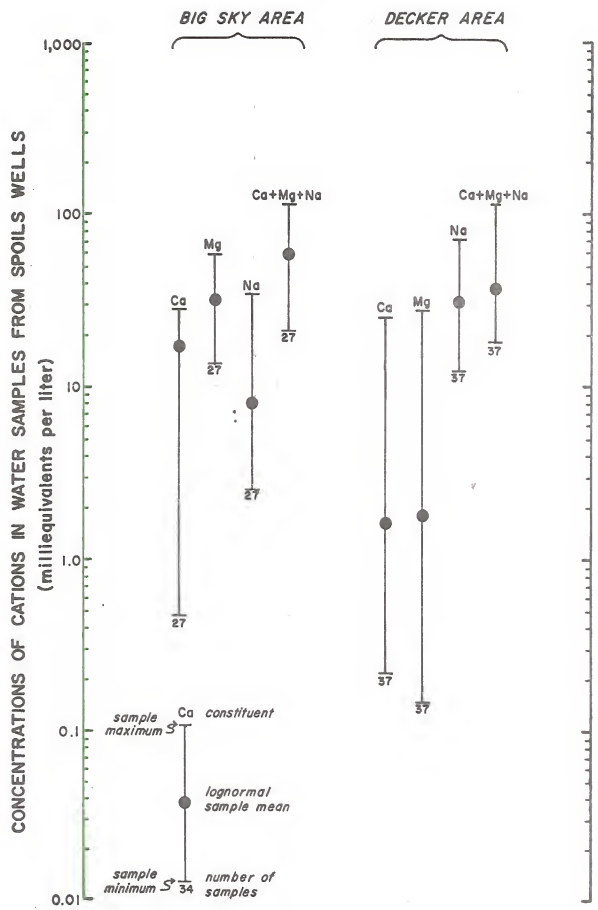


Figure 24.-Ranges and lognormal mean values of cation concentrations in ground waters sampled from Big Sky and Decker mine spoils, southeastern Montana.

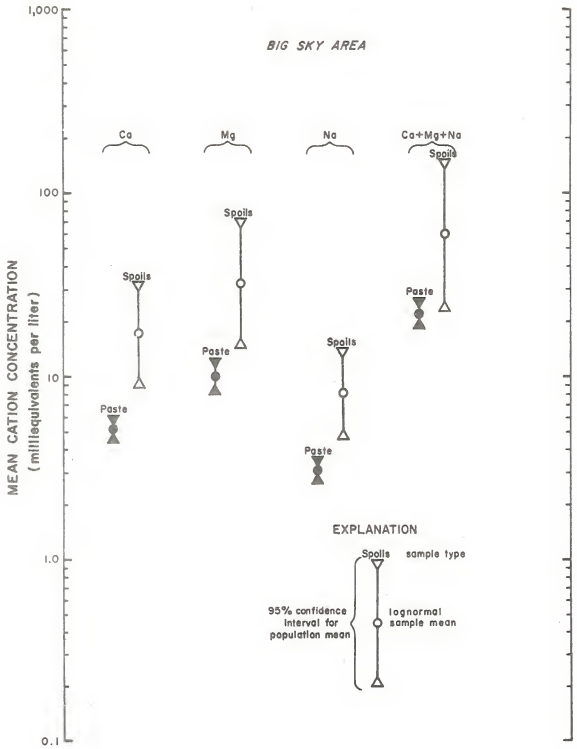


Figure 25.-Ninety-five-percent confidence intervals for mean cation concentrations in saturated-paste extracts and spoils waters from the Big Sky mine, southeastern Montana.

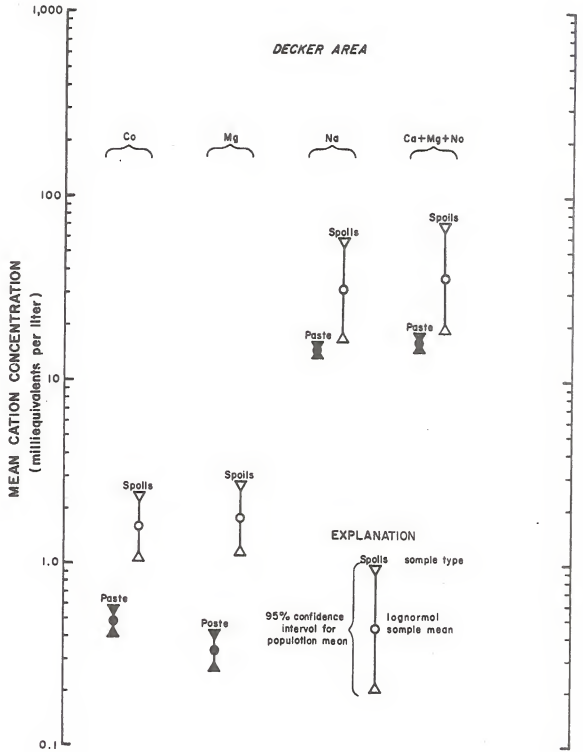


Figure 26.-Ninety-five-percent confidence intervals for mean cation concentrations in saturated-paste extracts and spoils waters from the Decker mine, southeastern Montana.

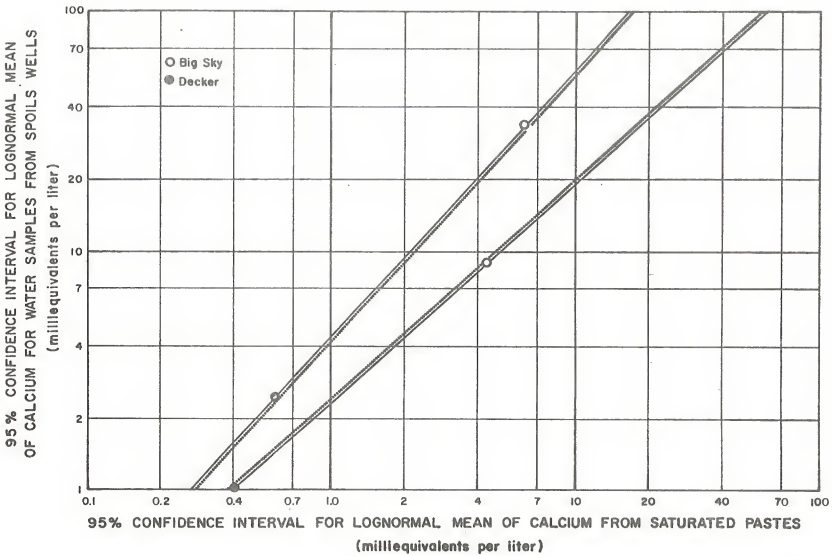


Figure 27.-Nomograph relating maximum (upper diagonal) and minimum (lower diagonal) limits of lognormal mean calcium concentrations in saturated-paste extracts and spoils waters from the Big Sky and Decker mines, southeastern Montana.

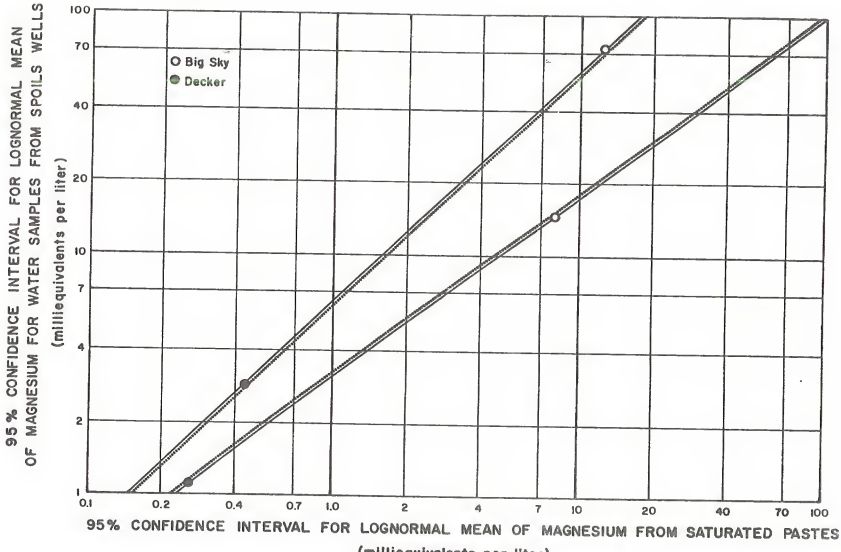


Figure 28.-Nomograph relating maximum (upper diagonal) and minimum (lower diagonal) limits of lognormal mean magnesium concentrations in saturated-paste extracts and spoils waters from the Big Sky and Decker mines, southeastern Montana.

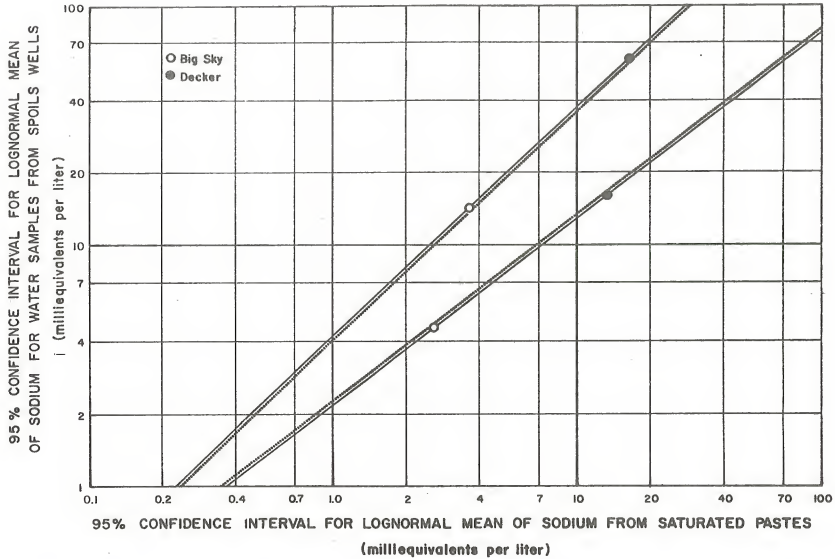


Figure 29.-Nomograph relating maximum (upper diagonal) and minimum (lower diagonal) limits of lognormal mean sodium concentrations in saturated-paste extracts and spoils waters from the Big Sky and Decker mines, southeastern Montana.

a hypothetical proposed mine area for which a total of 200 saturated-paste extract analyses are available, yielding the following sample statistics for the logs of concentrations of the three principal cations:

calcium: mean of logs = 0.300
standard deviation of logs = 0.600

magnesium: mean of logs = 0.400
standard deviation of logs = 0.900

sodium: mean of logs = 0.600
standard deviation of logs = 0.300

After constructing the confidence intervals at 95 percent by standard statistical techniques and finding the inverse logs, estimates of the ranges of population means for the paste would be:

mean of calcium concentrations: 1.65 meq/l to 2.42 meq/l

mean of magnesium concentrations: 1.88 meq/l to 3.35 meq/l

mean of sodium concentrations: 3.62 meq/l to 4.38 meq/l

Applying the range for calcium concentrations to the calcium nomograph (Fig. 27), find 1.65 meq/l on the abcissa (horizontal scale), read upward to the lower diagonal and left to the ordinate (vertical scale) to find the lower limit of the population mean for spoils waters (3.65 meq/l). The upper limit is found similarly by reading upward from 2.42 meq/l on the abcissa to the upper diagonal, then left to the ordinate (11.7 meq/l). The same procedures are followed for magnesium (Fig. 28) and for sodium (Fig. 29). Results would be the following estimates of ranges of mean concentrations in post-mining ground waters:

calcium: 3.65 meq/l to 11.7 meq/l

magnesium: 4.95 meq/l to 20.5 meq/l

sodium: 5.85 meq/l to 17.0 meq/l

The wide ranges of the estimates are caused by the extreme diversity that has been found in spoils-water quality, by the small number

of water analyses from each mine, and by the 95-percent-confidence interval selected for prediction. Additional analyses of spoils-waters will enable refinement of the nomographs toward narrower ranges. They should also be applied to other mine areas where paste-extract and spoils-water quality are available to learn if such correlations are truly linear. Other shortcomings of the nomographs are their failure to acknowledge the quality of input waters such as ground waters that enter spoils laterally from undisturbed areas, and their restriction to estimates only of calcium, magnesium, and sodium concentrations.

When attempts were made in the study to adjust spoils-water quality to compensate for incoming ground water from undisturbed aquifers, correlations with quality of paste extracts became unacceptably poor. When attempts were made to correlate specific-conductance values of spoils waters with those of paste extracts, the results were also unacceptable. In future overburden analyses, determinations of sulfate content in paste extracts would enable estimates of anion concentrations; chloride concentrations are usually very minor, so bicarbonate meq/l can be approximated by subtracting sulfate meq/l from the sum of cations.

Although the nomographs developed in this study are indicators of very wide ranges of mean concentrations, they can provide some insight into post-mining water quality. Planners who would like to predict cation concentrations more specifically (but with zero statistical confidence) can use geometric centerlines on the nomographs to estimate mean values.

SUMMARY

More than 13.3 billion tonnes of subbituminous coal are present within Montana's portion of the Fort Union Coal Region. Mining of these

reserves has been accelerating since the reopening of the Rosebud mine in 1968. Subsequently the Big Sky, Decker, and Absaloka mines have been opened for production. Many of the coal beds destined for mining are also aquifers that supply ground-water supplies vital to the area's agricultural economy.

Measurements in observation wells indicate that ground-water levels near the Rosebud, Big Sky, and Absaloka mines have not changed substantially during mining. Those near Decker have declined more than 3 meters within 3 kilometers west of the mine.

As backfilling has followed coal removal, ground waters have reentered spoils at the mines. Greatest resaturation has occurred where nearby sources of recharge are available. Near experimental impoundments at the Rosebud and Big Sky mines, saturated thicknesses have been increased by about 5 meters because of local recharge. Near the Tongue River Reservoir at the Decker mine, saturated thickness of the spoils is almost 14 meters because of recharge from the reservoir.

Hydraulic conductivity, the capacity to transmit water, was found to be similar for mine spoils and for coal beds. Of 17 values determined from field tests of spoils near Colstrip, lognormal-mean hydraulic conductivity was 0.11 m/d (meters per day); values ranged between 0.003 m/d and 291 m/d. From six tests at Decker, lognormal-mean hydraulic conductivity was 0.06 m/d; values ranged from 0.003 m/d to 12.4 m/d. In comparison, 66 tests of undisturbed coal-bed aquifers in the Region gave a lognormal-mean hydraulic conductivity of 0.29 m/d within a range from 0.001 m/d to 20.7 m/d. Most spoils-water flow probably occurs along "mine-floor" aquifers where a variable thickness of wasted coal and coarse rubble have been covered by finer-grained materials. Calculations

based upon water-level reactions to barometric changes generate very low storage-coefficient values (0.00001 to 0.00003) that are indicative of an aquifer confined between strata of less permeable materials. Evidence is very strong that mine spoils do not act as barriers to ground-water flow, and in some places can provide adequate quantities of water for stock or domestic use.

Quality of spoils waters is very diverse. The cations, calcium, magnesium, and sodium, and the anions, sulfate and bicarbonate occur over a wide range of concentrations and ratios; chloride concentrations are minor compared with those of other ions. Sodium and bicarbonate are generally predominant in Decker spoils waters; calcium, magnesium, and sulfate are the principal constituents in most Colstrip-area spoils waters. The variability of water quality in mined areas is probably caused by the following factors: 1) variability of saturated thicknesses; 2) insufficient time for establishment of complete circulation of ground water; and, 3) complex distribution of available salts in the spoil materials.

Colstrip-area spoils waters are statistically more highly mineralized than regional coal-bed waters and waters used locally for stock and domestic supplies. Decker spoils waters are not statistically more mineralized than the regional ground waters, but do contain statistically higher dissolved-solids concentrations than do nearby stock and domestic supplies.

Many trace elements are detectable in waters from the mined lands; in most cases the concentrations are not alarmingly high. Lead concentrations that apparently exceed recommended limits were commonly found in the spoils waters when analyzed by flame atomic absorption methods,

but could not be substantiated by other analytical methods.

Leaching experiments conducted with spoils produced waters of similar quality to those found in the field. Rapidity of dissolution of magnesium, sodium, and sulfate in the leaching experiments suggests that they occur in overburden and spoils as highly soluble salts. First pore volumes of leachates were found to have very similar quality to saturated-paste extracts. Extract analyses from Big Sky and Decker mine overburden were equally or more diverse than those of spoils waters, but were generally of similar chemical types.

Because of the diversities of spoils-water and extract qualities, statistical methods were employed toward comparisons that might lead to use of extract chemistry for predictions of spoils-water quality. Nomographs comparing idealized statistical distributions of calcium, magnesium, and sodium in overburden extracts and in spoils waters at the Big Sky and Decker mines were generated during the study. From these, probable ranges of lognormal mean concentrations of calcium, magnesium, and sodium may be predicted for spoils waters at proposed mines where saturated-paste-extract analyses have been conducted on overburden. A similar attempt toward predicting specific conductance through statistical correlations did not appear successful.

The nomographs provide a very general means at cation predictions. Additional data such as sulfate analyses of paste extracts, more spoils-water quality analyses from the Big Sky and Decker mines, and similar data from other mines may allow refinement of the nomographs toward greater precision.

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APPENDIX A

Summaries of Water-Level Measurements in Undisturbed Aquifers

LOCATION	DESIGNATION	LAND SURFACE ALTITUDE (METERS)	WELL DEPTH (METERS)	MEASURED DEPTHS TO WATER BELOW LAND SURFACE								TOTAL VARIATION (METERS)	NET CHANGE (METERS)	MEAN WATER SURFACE ALTITUDE (METERS)	AQUIFER
				INITIAL (METERS)	(DATE)	MAXIMUM (METERS)	(DATE)	MINIMUM (METERS)	(DATE)	MOST RECENT (METERS)	(DATE)				
2N 41E 29AAAC	P-11	972.1	7.6	7.34	2Y 3/75	7.34	2Y 3/75	1.84	10/19/77	1.97	4/13/78	.54	+ .41	970.7	ALLUVIUM
2N 41E 29AACA	P-12	973.3	7.9	1.81	2Y 3/75	1.81	2Y 3/75	.68	7/17/75	1.12	4/13/78	1.35	+ .68	971.1	ALLUVIUM
2N 41E 29DAAD01	S-12	992.7	13.7	4.12	10/23/73	4.91	11/14/77	3.89	6/16/75	4.26	4/11/78	.69	- .16	988.4	MCKAY COAL
2N 41E 29DAAD02	S-13	992.1	7.3	4.80	10/23/73	4.94	2/14/74	5.56	7/16/75	6.08	4/11/78	.99	+1.06	985.9	ROSEBUD COAL
2N 42E 23CCAA01	I-4	1010.2	21.9	5.97	10/23/73	5.97	10/23/73	6.36	4/ 4/75	7.13	2Y 3/75	.74	+1.16	1003.0	ROBINSON COAL
2N 42E 36AAAB01	A-4	1000.5	33.6	14.15	10/24/73	14.15	10/24/73	13.46	3/18/74	13.76	2Y 3/75	.70	+1.16	1012.0	ROBINSON COAL
2N 42E 36AAAB02	A-5	1000.5	59.7	52.41	8/24/73	52.49	2Y 3/75	52.41	8/24/73	52.49	2Y 3/75	.08	+1.39	1004.6	ROSEBUD-MCKAY COAL
2N 42E 36CCAA01	A-6	1051.6	13.7	2.34	10/24/73	2.92	2Y 3/75	1.81	4/ 4/75	32.26	2Y 3/75	.62	+ .43	1049.0	ROBINSON COAL
2N 42E 36CCAA02	A-7	1051.6	34.1	14.11	10/24/73	14.11	10/24/73	14.09	4/ 4/75	2.33	2Y 3/75	1.11	+9.58	1049.2	ROSEBUD-MCKAY COAL
2N 42E 36DAAD01	A-8	1004.4	43.3	34.54	10/23/73	34.92	12/11/73	34.51	4/ 4/75	34.89	2Y 3/75	.53	+ .02	1036.5	ROBINSON COAL
2N 42E 36DAAD02	A-9	1004.5	59.5	47.19	5/17/74	47.19	5/17/74	45.40	4/ 4/75	47.85	2Y 3/75	.31	+ .24	1052.0	ROSEBUD-MCKAY COAL
2N 43E 19AAAB02	A-44	1002.0	34.8	13.44	8/24/73	13.44	8/24/73	13.40	4/ 4/75	47.85	2Y 3/75	.36	+ .85	1039.5	ROBINSON COAL
2N 43E 19ADDA01	A-45	1002.0	34.8	13.52	8/24/73	13.52	8/24/73	13.47	4/ 4/75	13.76	2Y 3/75	.26	+ .68	1040.4	ROSEBUD-MCKAY COAL
2N 43E 31DAAB02	S-24	1002.7	39.0	14.49	8/24/73	14.49	8/24/73	13.66	4/ 4/75	33.57	2Y 3/75	.14	+ .05	1048.5	ROBINSON COAL
2N 43E 31DDAA03	S-25	1002.7	81.4	33.43	8/24/73	33.43	8/24/73	33.43	11/17/77	34.28	2Y 3/75	.84	+ .85	1048.5	ROSEBUD-MCKAY COAL
1N 43E 1 1CCCBC01	S-29	1000.7	48.8	32.41	1/18/75	32.41	1/18/75	31.17	1/ 6/76	33.41	2Y 3/75	.30	+ .18	1059.3	ROBINSON COAL
1N 43E 1 1CCCBC02	S-23	1000.7	59.4	38.58	1/18/75	38.58	1/18/75	38.07	4/13/78	38.07	4/13/78	.64	+ .54	1038.2	MCKAY COAL
1N 43E 1 3CCCBC03	S-26	1000.7	45.4	32.22	1/18/75	38.13	2Y 3/75	30.13	4/13/78	30.13	4/13/78	.40	+ .37	1039.3	SAWSTONE ABOVE MCKAY
1N 43E 15AAAB	P-10	1004.2	39.6	4.15	1/18/75	4.15	1/18/75	4.30	11/14/77	31.99	4/13/78	.69	- .23	1029.6	ROSEBUD COAL
1N 43E 15AABA	P-09	1004.8	16.2	7.66	1/18/75	7.66	1/18/75	5.81	4/13/78	5.81	4/13/78	.49	+ .49	1058.2	ROSEBUD COAL
1N 43E 15ABAB	P-08	1002.7	13.1	5.24	1/18/75	5.27	7/16/75	5.24	4/13/78	5.33	4/13/78	.36	+ .36	1057.3	ROSEBUD COAL
1N 43E 15ACBD	P-07	1003.4	14.3	6.15	1/18/75	6.15	7/16/75	6.44	4/13/78	6.45	4/13/78	.40	+ .40	1057.8	ROSEBUD COAL
1N 43E 15CAAD	S-11	981.7	8.8	10.74	10/23/73	17.27	12/12/77	10.74	10/23/73	11.78	4/11/78	.54	+ .97	980.2	MCKAY COAL
1N 43E 15DACC01	S-08	980.1	14.5	9.90	10/23/73	17.43	10/17/77	9.43	5/24/75	9.78	4/11/78	.90	+ .20	982.8	MCKAY COAL
1N 43E 22AAAD	P-05	992.6	10.7	7.12	12/19/74	7.41	1/18/75	6.12	5/13/75	6.30	4/13/78	1.29	+ .73	991.2	MCKAY COAL
1N 43E 22AADB01	P-03	994.3	10.4	7.54	12/19/74	7.54	12/19/74	1.38	5/13/75	1.76	4/13/78	1.27	+ .76	988.4	ALLUVIUM
1N 43E 22ADBB02	P-06	992.1	9.1	6.42	12/19/74	6.66	1/18/75	3.17	5/ 5/75	3.76	4/13/78	1.29	+ .83	988.3	ALLUVIUM
1N 43E 22BBBB	P-02	994.1	11.0	7.84	12/19/74	7.84	12/19/74	4.51	5/24/75	5.25	4/13/78	1.23	+ .76	988.4	ALLUVIUM
1N 43E 22CBAA	P-01	995.1	11.0	9.41	12/19/74	9.47	1/18/75	6.37	5/13/75	6.76	4/13/78	1.16	+ .70	988.4	ALLUVIUM
1N 43E 28ACDB01	S-27	1004.2	19.2	5.31	7/11/74	5.31	7/11/74	4.51	5/13/75	4.88	4/13/78	1.26	+ .63	999.1	ALLUVIUM
1N 43E 28ACDD02	S-26	1018.8	19.8	14.21	2Y 4/75	34.48	10/19/77	33.37	10/ 8/76	34.17	4/13/78	1.03	+ .44	984.7	ALLUVIUM
1N 43E 29AAAB01	S-06	994.3	14.3	29.16	2Y 4/75	29.47	4/11/78	29.01	4/14/76	29.47	4/11/78	1.45	+1.31	992.6	ROSEBUD COAL
1N 43E 29ADBB02	S-07	994.3	14.3	11.41	10/23/73	11.42	2Y 4/75	11.19	4/11/78	11.19	4/11/78	.22	+ .23	992.8	MCKAY COAL
1N 43E 30AAAA	P-13	1000.0	20.1	7.09	10/23/73	DRY	DRY	9.84	2Y 3/75	DRY	DRY	.27	0.00	987.4	ROSEBUD COAL(ABJACENT TO CUT)
1N 43E 30ACAC	S-25	1019.6	48.8	35.71	2Y 4/75	35.76	2Y 4/75	34.40	4/12/78	34.40	4/12/78	1.31	+ .31	984.4	MCKAY COAL
1N 43E 30AC BP	S-24	1019.6	30.5	34.70	2Y 4/75	34.71	4/24/75	34.55	12Y 4/75	34.40	4/12/78	1.31	+ .31	984.4	MCKAY COAL
1N 43E 34AAAA01	S-19	1030.4	75.6	38.44	7/11/74	39.15	4/18/78	38.33	3/19/76	39.14	4/12/78	.16	+ .10	994.9	ROSEBUD COAL
1N 43E 34AAAB02	S-18	1030.4	44.5	38.17	7/11/74	38.17	7/11/74	38.03	3/19/76	38.15	4/12/78	.02	+ .98	1030.9	MCKAY COAL
1N 43E 34ADCC01	S-20	1043.1	61.7	43.04	1/18/75	43.04	1/18/75	42.50	4/13/78	42.50	4/13/78	.11	+ .02	1049.2	ROSEBUD COAL
1N 43E 34ADDC02	S-21	1043.1	54.4	37.24	12/19/74	37.24	12/19/74	37.24	3/18/76	37.42	4/13/78	.18	+ .58	1018.4	MCKAY COAL
1N 43E 21DADD01	MW-03	1015.1	47.5	28.93	8/24/73	29.27	8/14/78	28.93	8/28/75	21.46	4/13/78	.19	- .16	1015.7	ROSEBUD COAL
1N 43E 21DADD02	MW-04	1015.1	34.2	18.14	8/24/73	18.21	8/14/78	18.14	8/28/75	18.91	4/13/78	.77	+ .53	996.4	ROSEBUD COAL
1N 43E 22ADCB01	MW-41	1030.2	53.9	43.47	4/ 8/77	45.17	12/13/77	43.47	4/ 8/77	43.80	4/12/78	1.83	- 1.83	986.2	ROSEBUD COAL
1N 43E 22ADCB02	MW-42	1030.2	44.5	32.41	4/ 8/77	32.92	4/11/78	32.39	4/ 4/77	32.92	4/13/78	2.34	- .18	984.2	MCKAY COAL
1N 43E 24CAAD	MW-16	982.6	9.4	5.39	8/22/75	5.54	8/22/77	5.18	4/ 8/77	5.41	4/12/78	.44	- .41	997.7	ALLUVIUM
1N 43E 24CACC	MW-17	984.3	7.3	3.57	8/22/75	4.04	8/22/77	2.74	4/ 8/77	3.21	4/12/78	.36	- .18	997.1	ALLUVIUM
1N 43E 24CCAC	MW-13	982.2	6.7	2.65	8/22/75	2.74	9/26/77	1.94	4/ 8/77	2.07	4/12/78	1.48	+ .03	994.1	ALLUVIUM
1N 43E 24CCBA	MW-14	984.3	7.3	3.77	8/22/75	3.78	9/26/77	3.29	4/ 8/77	3.47	4/12/78	.70	+ .60	996.8	ALLUVIUM
1N 43E 27AAAD02	S-17	981.8	4.9	2.92	10/23/73	DRY	3/14/78	2.92	10/23/73	3.39	4/12/78	.47	+ .34	996.8	ALLUVIUM
1N 43E 27AADB01	MW-15	981.5	4.9	DRY	DRY	DRY	DRY	DRY	DRY	3.69	4/12/78	DRY	+ .74	996.8	ALLUVIUM
1N 43E 27ADCC01	MW-28	998.4	29.6	14.93	10/ 3/75	15.93	7/21/76	13.70	4/13/78	DRY	4/12/78	DRY	- -	< 977.2	ALLUVIUM
1N 43E 27ADCC02	MW-29	998.4	29.6	14.98	10/ 3/75	15.81	7/21/76	15.05	4/29/77	15.78	4/13/78	2.21	+ 1.06	981.7	MCKAY COAL
1N 43E 27ADCC03	MW-31	1013.5	47.2	27.66	10/ 3/75	29.32	7/21/76	27.66	4/29/77	28.14	4/13/78	2.17	- .44	982.4	MCKAY COAL
1N 43E 27ADCC04	MW-30	1013.4	44.5	27.66	10/ 3/75	29.30	7/21/76	27.13	5/ 4/77	27.77	4/13/78	1.86	+ .11	985.7	ROSEBUD COAL
1N 43E 27DDAA01	MW-26	1015.3	39.0	29.97	10/ 3/75	32.04	7/21/76	30.75	4/13/78	30.75	4/13/78	2.20	+ .96	984.5	MCKAY COAL
1N 43E 27DDAD02	MW-27	1013.7	40.4	29.97	10/ 3/75	29.97	7/21/76	29.44	5/ 4/77	29.44	4/13/78	.92	+ .52	984.0	ROSEBUD COAL
1N 43E 27DCAC	MW-32	1021.1	47.2	29.56	10/ 3/75	31.66	7/21/76	30.78	5/ 4/77	31.34	4/13/78	.84	- .32	986.2	ROSEBUD COAL
1N 43E 27DDAA02	S-14	998.9	15.4	14.19	10/23/73	14.33	5/ 4/77	9.44	4/12/78	9.44	4/12/78	.91	+ .91	989.5	ROSEBUD COAL
1N 43E 27DDCA	MW-33	1021.1	44.2	29.33	5/ 5/77	29.33	5/ 5/77	9.44	4/12/78	9.44	4/12/78	4.08	+ 4.75	977.2	MCKAY COAL
1N 43E 27DDCB02	MW-38	998.2	35.4	19.82	5/ 5/77	19.82	5/ 5/77	15.71	4/12/78	41.80	4/12/78	.44	+ .44	978.8	ROSEBUD COAL
1N 43E 28BBDD02	MW-37	1027.2	51.2	29.82	5/ 5/77	29.82	5/ 5/77	15.71	4/12/78	15.71	4/12/78	2.30	+ 2.30	979.1	MCKAY COAL
1N 43E 28BDDB02	MW-34	1027.2	34.4	22.03	8/24/75	27.35	7/21/77	25.48	10/19/77	27.17	4/13/78	.48	- .77	1000.2	MCKAY COAL
1N 43E 29BAAB01	MW-24	1033.3	53.7	27.03	8/24/75	27.79	10/19/77	22.82	11/ 5/75	22.67	4/13/78	.77	- .64	1004.7	ROSEBUD COAL
1N 43E 29BAAB02	MW-25	1033.3	53.9	26.72	8/24/75	30.86	10/19/77	30.50	3/19/76	30.80	4/13/78	.26	+ .09	988.5	MCKAY COAL
1N 43E 35ADDB01	MW-09	1002.4	39.8	DRY	8/24/75	DRY	8/24/75	DRY	9/11/76	DRY	9/11/76	- -	- -	< 976.6	MCKAY COAL

LOCATION	DESIGNATION	LAND SURFACE ALTITUDE (METERS)	WELL DEPTH (METERS)	MEASURED DEPTHS TO WATER BELOW LAND SURFACE: INITIAL (METERS)	INITIAL (DATE)	MAXIMUM (METERS)	MAXIMUM (DATE)	MINIMUM (METERS)	MINIMUM (DATE)	MOST RECENT (METERS)	MOST RECENT (DATE)	TOTAL VARIATION (METERS)	NET CHANGE (METERS)	MEAN WATER SURFACE ALTITUDE (METERS)	AQUIFER
1N 41E 35[illegible]CDD02	HS-10	1002.8	21.9	DRY	8/28/75	DRY	9/11/76	DRY	9/11/76	DRY	9/11/76	- -	- -	< 980.8	ROSEBUD COAL
1N 42E 7C[illegible]	S-05	991.3	10.1	7.05	10/23/73	7.56	2/14/78	6.22	6/24/76	6.91	4/11/78	1.33	+ .15	984.4	ALLUVIUM
1N 43E 17[illegible]A	S-06	978.4	8.5	5.90	10/23/73	6.42	4/ 1/75	5.37	7/16/75	5.75	4/12/78	1.05	+ .23	972.5	MCKAY COAL
1N 43E 18AAA[illegible]D02	S-03	987.7	21.2	13.96	10/23/73	14.08	3/10/74	13.48	4/12/78	13.48	4/12/78	.59	+ .45	974.0	MCKAY COAL
1N 43E 18DBAB01	FPA-11	978.3	17.4	8.26	12/10/74	8.26	12/10/74	6.27	8/28/76	6.35	4/12/78	2.00	+ 1.91	971.3	MCKAY COAL
1N 43E 18DBAC01	FPA-09	978.2	17.1	8.03	12/10/74	8.03	12/10/74	6.42	4/12/78	6.42	4/12/78	1.61	+ 1.61	971.0	MCKAY COAL
1N 42E 18DBAD01	FPA-01	975.7	18.6	5.86	12/10/74	5.86	12/10/74	3.97	1/17/78	3.97	1/17/78	1.88	+ 1.88	971.0	MCKAY COAL
1N 42E 18DBDD03	FPA-07	975.9	14.3	5.02	12/10/74	5.05	2/ 4/75	3.90	1/17/78	3.90	1/17/78	2.15	+ 1.12	971.4	MCKAY COAL
7S 44E 34AAA[illegible]01	HC-03	1158.2	26.2	16.94	2/ 5/75	16.94	2/ 5/75	16.47	5/28/76	16.48	10/ 8/76	.47	+ .45	1141.6	DIETZ COAL
7S 44E 34AAA[illegible]02	HC-04	1158.2	82.9	56.64	2/ 5/75	56.68	10/ 8/76	56.56	5/ 2/75	56.68	10/ 8/76	.12	- .04	1101.6	CANYON COAL
7S 44E 36DDD01	HC-01	1161.3	29.0	15.93	2/ 5/75	15.93	2/ 5/75	15.59	5/28/76	15.59	5/28/76	.34	+ .34	1145.5	DIETZ COAL
7S 44E 36DAD[illegible]02	HC-02	1161.3	6.1	1.96	2/ 5/75	1.95	8/ 5/75	1.91	5/ 2/75	1.95	10/ 8/76	.05	+ .01	1159.4	ALLUVIUM
8S 38E 17[illegible]	SH-614	1365.6	106.1	44.02	10/13/76	44.02	10/13/76	43.22	6/ 8/77	43.68	10/26/77	.80	+ .34	1322.0	DIETZ 1 & DIETZ 2 COAL COMB.
8S 38E 17[illegible]	SH-614A	1365.8	48.5	34.93	10/13/76	35.09	2/24/77	34.92	6/ 8/77	34.96	10/26/77	.17	- .03	1330.8	ANDERSON
8S 39E 20[illegible]01	SH-625	1276.1	56.7	13.84	8/14/76	13.84	8/14/76	11.65	4/19/78	11.65	4/19/78	2.19	+ 2.19	1263.8	DIETZ 1 & DIETZ 2 COAL COMB.
8S 39E 20[illegible]02	SH-625A	1276.1	27.6	17.01	8/14/76	17.96	11/12/76	15.09	4/14/77	16.72	4/19/78	2.87	+ .29	1259.0	ANDERSON
8S 39E 32[illegible]C	WR-21	1185.7	62.8	17.56	9/18/75	17.56	9/18/75	16.61	5/ 5/76	17.17	4/19/78	.95	+ .40	1168.5	DIETZ 1 & DIETZ 2 COAL COMB.
8S 40E 26C[illegible]	WRN-01	1055.5	9.0	8.7[illegible]	3/ 3/75	DRY	12/12/76	8.69	4/17/78	8.71	5/16/78	.30	+ .01	1046.7	DIETZ 2 COAL
8S 40E 33AAC[illegible]01	WRN-02	1064.6	26.9	16.56	1/ 6/75	16.67	5/ 1/75	16.39	6/ 9/77	16.41	4/17/78	.28	+ .15	1048.1	DIETZ 2 COAL
8S 40E 33AAC[illegible]02	WRN-03	1064.1	18.0	16.38	1/ 6/75	17.06	11/17/76	16.33	4/ 4/75	16.35	4/17/78	.73	+ .03	1047.5	ANDERSON/DIETZ 1 CLINKER COMB
8S 40E 33C[illegible]	WRN-04	1064.6	11.9	4.08	1/ 6/75	4.08	1/ 6/75	3.15	6/17/78	3.15	6/17/78	.93	+ .93	1061.0	ANDERSON/DIETZ 1 COAL COMB.
8S 40E 33CADB01	WRN-05	1059.2	25.9	4.66	1/ 6/75	4.82	11/19/76	4.52	4/17/78	4.52	4/17/78	.31	+ .15	1054.5	DIETZ 2 COAL
8S 40E 33CADA02	WRN-06	1059.6	14.6	3.20	1/ 6/75	3.36	8/13/76	2.88	2/23/77	3.15	4/17/78	.48	+ .05	1056.4	ANDERSON/DIETZ 1 COAL COMB.
8S 40E 33CADC	WRN-07	1061.4	14.9	3.14	1/ 6/75	3.51	8/13/76	2.72	3/ 4/75	2.98	4/17/78	.79	+ .15	1058.3	ANDERSON/DIETZ 1 COAL COMB.
8S 40E 34D[illegible]AD	WRN-08	1043.5	15.2	3.44	1/ 6/75	3.89	10/11/75	.27	6/ 8/77	2.55	4/17/78	3.62	+ .93	1041.1	DIETZ 2 COAL
8S 40E 34DBDA01	WRN-09	1043.6	56.4	1.09	1/ 6/75	3.44	9/27/77	.12	7/10/75	2.31	4/17/78	3.31	- 1.22	1041.9	CANYON COAL
8S 40E 34DBDA02	WRN-9A	1043.6	39.3	2.41	4/17/78	2.41	4/17/78	2.41	4/17/78	2.41	4/17/78	0.00	0.00	1041.2	DIETZ INTERBURDEN
8S 42E 14[illegible]D01	HWC-13	1140.0	57.0	46.50	8/ 5/75	46.50	8/ 5/75	46.36	3/12/76	46.47	9/22/76	.14	+ .04	1093.5	DIETZ COAL
8S 42E 14D[illegible]D02	HWC-14	1140.0	31.4	13.95	8/ 5/75	15.00	9/22/76	13.95	8/ 5/75	15.00	9/22/76	1.05	- 1.05	1125.3	ANDERSON
8S 43E 20DDDD	HWC-01	1075.9	70.7	27.45	6/ 5/74	27.51	9/30/74	27.13	3/ 5/75	27.48	9/22/76	.37	- .03	1048.5	CANYON COAL
8S 44E 3CDDB01	HC-08	1167.4	61.0	40.43	7/11/75	40.50	5/28/76	40.43	7/11/75	40.49	10/ 8/76	.07	- .06	1126.9	DIETZ COAL
8S 44E 3CDDB02	HC-09	1167.4	39.3	22.32	7/11/75	22.32	7/11/75	21.99	5/28/76	22.23	10/ 8/76	.33	+ .09	1145.2	DIETZ COAL
8S 44E 19CDBA01	HWC-04	1133.9	59.1	48.11	7/10/75	48.12	10/19/76	47.80	8/ 5/75	48.12	10/19/76	.32	- .02	1085.8	DIETZ COAL
8S 44E 19CDBA02	HWC-05	1133.9	40.2	24.15	7/10/75	24.15	7/10/75	23.99	3/ 9/76	24.03	10/19/76	.16	+ .12	1109.8	ANDERSON COAL
8S 44E 32DBAB	HWC-28	1140.0	55.8	31.98	5/12/77	32.23	7/ 7/77	31.97	6/ 8/77	31.98	10/19/77	.26	+ .00	1107.9	ANDERSON COAL
8S 45E 8DBCC	HC-05	1182.6	64.6	31.69	7/14/75	47.51	5/28/76	31.69	7/14/75	47.52	10/ 8/76	15.84	-15.83	1140.4	DIETZ COAL
8S 45E 16DDCB01	HC-06	1132.3	57.3	24.94	7/ 1/75	25.09	8/ 5/75	24.91	3/ 9/76	25.01	10/ 8/76	.18	- .08	1107.3	CANYON COAL
9S 39E 1AADC	WR-23	1207.0	98.1	25.43	9/18/75	25.43	9/18/75	24.75	4/14/77	24.78	4/19/78	.68	+ .65	1182.1	DIETZ 1 & DIETZ 2 COAL COMB.
9S 38E 7DAB	SH-626	1415.7	132.6	108.51	6/24/76	108.51	6/24/76	108.51	6/24/76	108.51	6/24/76	0.00	0.00	1307.2	ANDERSON/DIETZ 1 & 2 COAL
9S 38E 10CCAA01	SH/EPA-01	1261.4	89.9	29.04	2/ 4/76	29.36	8/12/76	28.54	4/18/78	28.54	4/18/78	.82	+ .50	1232.4	DIETZ 1 & DIETZ 2 COAL COMB.
9S 38E 10CCAA02	SH/EPA-02	1261.4	29.9	18.25	2/ 4/76	18.33	4/ 8/76	18.07	4/18/78	18.07	4/18/78	.26	+ .18	1243.2	ANDERSON COAL
9S 39E 22BADC	SH-391	1215.2	53.3	18.33	11/20/72	18.42	1/27/73	17.10	6/10/73	18.14	4/18/78	1.32	+ .20	1197.4	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 23CDAD	SH-388	1211.6	57.9	24.62	11/20/72	24.62	11/20/72	23.39	6/ 3/75	23.86	4/18/78	1.23	+ .76	1187.7	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 24BBBC	SH-396	1200.6	85.3	16.48	11/20/72	17.49	11/ 3/74	14.76	8/ 7/75	16.17	4/18/78	2.72	+ .32	1184.5	DIETZ 1 & DIETZ 2 COAL COMB.
9S 38E 24BCAC	SH-421	1194.2	80.5	10.10	7/28/73	10.14	8/12/73	7.77	8/ 7/75	8.57	4/18/78	2.37	+ 1.53	1185.5	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 25BCBA	SH-394	1191.5	73.8	28.78	11/20/72	28.85	11/30/77	27.79	5/10/77	27.85	4/18/78	1.06	+ .93	1163.3	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 25CBDC	SH-422	1193.9	57.0	37.62	7/28/73	37.62	7/28/73	36.87	6/ 3/75	37.25	4/18/78	.75	+ .37	1156.7	DIETZ 1 & DIETZ 2 COAL COMB.
9S 38E 25DACC01	YCP-02	1152.1	11.3	7.25	1/ 8/76	7.97	3/21/78	6.92	4/13/77	7.55	4/18/78	1.05	- .30	1144.6	ALLUVIUM
9S 38E 25DACC02	YCP-03	1152.1	10.4	6.16	1/ 8/76	6.89	3/21/78	5.86	4/13/77	6.50	4/18/78	1.03	- .34	1145.7	ALLUVIUM
9S 38E 25DCAA	YCP-01	1152.1	14.0	9.78	1/ 8/76	10.43	3/17/77	9.74	5/10/77	10.26	4/18/78	.69	- .48	1142.1	ALLUVIUM
9S 39E 26A[illegible]BB	SH-395	1188.7	91.4	20.09	11/20/72	20.09	11/20/72	19.61	2/23/78	19.63	4/18/78	.48	+ .47	1168.9	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 27ACBB	SH-424	1210.7	33.2	-1.41	7/ 8/74	-1.32	12/ 2/75	-1.92	3/ 4/75	-1.38	5/ 6/76	.60	- .03	1212.2	CANYON COAL
9S 38E 35AABD	SH-401	1240.5	79.2	58.34	11/20/72	58.36	11/20/72	57.78	8/12/76	57.85	4/18/78	.55	+ .48	1182.6	DIETZ 1 & DIETZ 2 COAL COMB.
9S 39E 14DABD01	WR-22	1124.7	108.8	69.92	9/18/75	70.41	1/ 8/76	69.48	7/15/76	70.25	4/19/78	.96	- .33	1054.8	ANDERSON,DIETZ 1,DIETZ 2 COAL
9S 39E 14DABD02	WR-22A	1124.7	56.4	52.72	3/12/77	52.72	3/12/77	51.64	4/19/78	51.64	4/19/78	1.08	+ 1.08	1072.4	ANDERSON,DIETZ 1,DIETZ 2 D.B.
9S 39E 14DCDD	WR-56E	1109.5	5.5	5.26	9/28/77	5.30	12/29/77	4.89	4/19/78	4.89	4/19/78	.41	+ .37	1104.3	SQUIRREL CREEK ALLUVIUM
9S 39E 14DDBD01	WR-56	1103.4	16.8	4.11	9/28/77	4.11	9/28/77	3.26	4/19/78	3.26	4/19/78	.86	+ .86	1099.6	SQUIRREL CREEK ALLUVIUM
9S 39E 14DDBD02	WR-56A	1103.4	7.3	4.08	9/28/77	4.08	9/28/77	3.25	4/19/78	3.25	4/19/78	.83	+ .83	1899.6	SQUIRREL CREEK ALLUVIUM
9S 39E 14DDCC	WR-56D	1104.9	8.2	2.81	9/28/77	3.38	3/22/78	2.74	4/19/78	2.74	4/19/78	.63	+ .06	1101.8	SQUIRREL CREEK ALLUVIUM
9S 39E 14DDCD01	WR-56B	1106.4	17.4	4.86	8/29/77	4.86	8/29/77	4.09	4/19/78	4.09	4/19/78	.77	+ .77	1101.8	SQUIRREL CREEK ALLUVIUM
9S 39E 14DDCD02	WR-56C	1106.4	7.0	4.79	9/28/77	4.79	9/28/77	4.01	4/19/78	4.01	4/19/78	.78	+ .78	1101.8	SQUIRREL CREEK ALLUVIUM
9S 39E 16AABA02	WR-20	1170.4	50.6	33.90	9/18/75	33.90	9/18/75	27.36	9/28/77	27.53	4/19/78	6.54	+ 6.37	1140.5	ANDERSON COAL
9S 39E 20BCCD01	TP-01	1155.2	10.1	7.44	2/ 4/76	8.79	11/17/76	5.10	5/10/77	5.79	4/18/78	3.70	+ 1.65	1147.9	ALLUVIUM
9S 39E 20BCCD02	TP-02	1155.2	9.8	6.81	2/ 4/76	8.38	11/17/76	4.48	5/10/77	5.12	4/18/78	3.90	+ 1.68	1148.5	ALLUVIUM
9S 39E 20DABB	WR-35	1184.7	94.5	37.41	6/22/77	37.59	4/18/78	37.32	8/ 2/77	37.59	4/18/78	.28	- .18	1147.2	DIETZ 1 AND DIETZ 2 COAL BEDS

LOCATION	DESIGNATION	LAND SURFACE ALTITUDE (METERS)	WELL DEPTH (METERS)	MEASURED DEPTHS TO WATER BELOW LAND SURFACE						TOTAL VARIATION (METERS)	NET CHANGE (METERS)	MEAN WATER SURFACE ALTITUDE (METERS)	AQUIFER
				INITIAL (METERS)	(DATE)	MAXIMUM (METERS)	(DATE)	MINIMUM (METERS)	MOST RECENT (DATE) (METERS)				
35 39E 2 AAACC01	WW-18	1138.4	114.1	91.82	8/ 8/75	72.17	1/28/77	91.73	5/11/77	19.64	4/19/78	-.44	-.12	1046.9	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 39E 2BBBB01	WW-14	1139.4	137.0	98.30	9/28/77	98.42	4/19/78	98.31	10/28/77	98.42	4/19/78	.11	-.09	1054.1	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 39E 2BBBA01	WW-13	1093.3	111.0	43.69	9/28/77	43.34	4/19/78	43.29	9/28/77	43.38	4/19/78	.09	-.04	1049.9	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 39E 2BCCA01	WW-16	1132.5	96.5	9.44	9/22/77	10.34	4/19/78	9.68	8/29/77	10.34	4/19/78	.76	-.50	1122.5	DIETZ 1 AND DIETZ 2 COAL BEDS
35 39E 2BCDD01	WW-17	1139.7	38.4	9.18	9/22/77	9.11	8/ 2/77	8.66	9/27/77	9.87	4/19/78	.23	-.03	1123.7	ANDERSON COAL BED
35 39E 2BDAC01	WW-12	1142.4	111.9	69.79	8/ 2/77	67.88	4/19/78	67.72	8/ 2/77	67.86	4/18/78	.16	-1.93	1074.6	ANDERSON-DIETZ 1 AND 2 COAL
35 39E 2BAAA01	WW-24	1147.1	41.4	73.36	9/ 6/77	73.34	4/19/78	73.27	7/14/76	73.34	4/19/78	.07	-.02	1074.1	ANDERSON COAL
35 39E 2BBCC01	WW-11	1151.1	44.2	76.37	9/ 6/77	76.34	11/28/77	76.32	9/ 6/77	76.38	4/18/78	.06	-.02	1074.7	ANDERSON COAL
35 39E 2BCCA01	WW-10	1147.1	138.5	98.84	9/22/77	98.23	4/19/78	98.78	9/27/77	98.23	4/18/78	.44	-.19	1127.1	DIETZ 1 AND DIETZ 2 COAL BEDS
35 39E 2BCAA01	WW-31	1147.1	97.3	96.88	9/22/77	96.56	4/19/78	96.80	8/22/77	96.96	4/18/78	.24	-.08	1130.1	ANDERSON COAL BED
35 39E 2BACA01	WW-33	1137.6	98.2	84.15	9/22/77	84.93	4/19/78	83.98	8/18/77	84.93	4/18/78	.94	-.78	1137.1	DIETZ 1 AND 2 CLINKER & COAL
35 39E 1DACC01	WW-32	1138.2	92.1	84.26	9/22/77	84.26	4/19/78	84.21	10/25/77	84.26	4/18/78	.05	-.05	1134.9	DIETZ 1 AND DIETZ 2 COAL BEDS
35 39E 1ACDA01	WW-40	1145.1	99.4	13.16	8/ 2/77	14.22	3/21/78	13.84	8/30/77	14.14	4/18/78	1.06	-1.02	1131.5	DIETZ 1 AND DIETZ 2 COAL BEDS
35 39E 1ACAA01	WW-34	1149.1	159.1	17.58	8/ 2/77	16.13	4/19/78	17.58	8/ 2/77	19.13	4/19/78	1.55	-1.55	1131.4	ANDERSON-DIETZ 1 AND 2 COAL
35 39E 1AAAA01	WW-27	1119.2	110.4	17.66	7/ 5/77	19.10	10/25/77	17.95	7/ 5/77	18.86	4/18/78	.91	-.59	1101.5	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 39E 1BDDD01	WW-26	1135.5	19.5	2.72	9/22/77	3.17	9/29/77	2.72	8/22/77	3.76	4/18/78	.44	-.02	1106.8	YOUNGS CREEK ALLUVIUM
35 39E 1BDDC01	WW-25	1136.5	19.5	3.84	9/22/77	3.84	9/29/77	3.68	4/18/78	3.68	4/18/78	-.16	-.17	1106.8	YOUNGS CREEK ALLUVIUM
35 39E 1BADD01	WW-42	1137.2	19.5	3.43	9/22/77	3.81	9/29/77	3.58	4/18/78	3.58	4/18/78	.42	-.04	1105.4	YOUNGS CREEK ALLUVIUM
35 39E 1BADC01	WW-43	1137.5	20.1	3.92	9/22/77	3.90	9/29/77	3.78	4/18/78	3.78	4/18/78	.41	-.04	1105.4	YOUNGS CREEK ALLUVIUM
35 39E 1BCCC01	WW-41	1139.3	12.2	4.27	9/22/77	4.26	9/29/77	4.27	8/22/77	5.32	4/18/78	.35	-.05	1104.8	YOUNGS CREEK ALLUVIUM
35 39E 1ACDD01	WW-44	1138.8	114.8	43.14	9/22/77	41.70	8/30/77	41.12	11/28/77	41.58	4/18/78	-.18	-.87	1094.5	ANDERSON-DIETZ 1 AND 2 COAL
35 39E 1CCCA01	WW-45	1113.4	110.9	47.39	9/ 6/77	47.61	3/29/77	47.26	8/ 2/77	47.36	4/19/78	.43	-.81	1066.1	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 40W 1 AAAA01	WW-21	1095.1	29.6	19.43	12/ 7/76	11.81	3/29/77	18.81	7/28/76	18.79	4/20/78	.98	-.64	1076.3	ALLUVIUM
35 40E 1DACC02	WW-20	1093.4	24.1	18.24	12/ 7/76	18.49	3/18/77	18.04	7/28/76	18.04	4/20/78	.89	-.20	1076.0	ALLUVIUM
35 40E 1BBAA01	WW-19	1094.5	24.1	19.30	12/ 7/76	8.31	10/31/77	7.74	7/ 5/77	8.08	4/17/78	2.57	-.42	1061.4	DIETZ 2 COAL
35 44W 1AAAA02	WW-31	1047.6	15.2	5.78	12/ 9/76	5.05	2/23/77	4.80	7/ 6/77	5.09	4/17/78	1.66	-.10	1042.0	ANDERSON-DIETZ 1 COAL & CLINK
35 44W 1AAAA01	WW-32	1044.6	23.5	21.50	12/ 9/76	21.04	3/23/77	21.13	7/28/76	21.04	4/20/78	.46	-.11	1043.9	ANDERSON-DIETZ 1 COAL CLINK
35 43W 4CCCA01	WW-33	1071.1	37.4	20.08	12/ 7/76	25.48	10/27/77	20.05	3/ 4/75	20.33	4/20/78	.41	-.24	1051.1	DIETZ 2 COAL
35 43W 4CBA01	WW-34	1071.1	23.8	20.82	12/ 7/76	20.04	8/ 4/77	19.94	3/ 4/75	19.94	4/20/78	.05	-.88	1051.2	ANDERSON-DIETZ 1 COAL COMP.
35 43E 4CCCA	WW-39	1096.4	101.8	42.45	4/28/78	42.45	4/28/78	42.45	4/28/78	42.45	4/28/78	0.00	0.00	1044.2	DIETZ 1 COAL
35 43E 4CCAA	WW-03	1098.8	84.5	48.91	11/24/78	57.18	8/ 1/77	48.34	4/28/78	56.83	11/29/78	8.75	8.36	1041.5	ANDERSON-DIETZ 1 COAL COMP.
35 44W 4AAAA01	WW-35	1063.7	43.6	22.16	12/ 7/76	23.79	7/19/76	22.16	12/ 7/76	23.32	4/20/78	1.63	1.16	1041.4	DIETZ 2 COAL
35 44W 4AAAB01	WW-36	1063.7	25.6	24.24	12/ 7/76	24.31	5/19/77	24.24	12/ 7/76	24.31	4/20/78	.07	.07	1041.4	ANDERSON-DIETZ 1 CLINKER COAL
35 44E 4AACA01	WW-02	1090.7	94.4	49.77	10/24/78	48.45	12/20/77	49.77	10/16/78	48.45	12/28/77	2.69	2.69	1040.3	ANDERSON-DIETZ 1 COAL COMP.
35 44E 4ACBA02	WW-01	1090.7	94.4	48.84	4/28/78	48.84	4/28/78	48.84	4/28/78	48.84	4/28/78	0.00	0.00	1041.9	ANDERSON-DIETZ 1 COAL COMP.
35 44W 4BBBA01	WW-37	1094.4	79.3	46.19	9/29/77	51.91	9/29/77	45.99	4/22/77	50.91	4/28/78	5.43	4.92	1044.6	DIETZ 2 COAL
35 44W 1DCAA01	WW-38	1095.8	76.8	54.26	9/29/77	54.26	9/29/77	51.71	12/27/77	54.26	4/28/78	2.55	2.55	1044.5	DIETZ 2 COAL
35 44W 11ECCC01	WW-17	1063.5	31.7	2.87	12/ 7/76	2.47	12/ 7/76	.47	9/ 7/77	2.55	4/19/78	2.08	.32	1061.4	DIETZ 2 COAL
35 43E 11ECCC02	WW-16	1063.5	9.8	1.90	12/ 7/76	1.57	12/ 7/76	1.05	7/ 5/77	1.17	4/19/78	2.92	.74	1060.8	ALLUVIUM
35 44W 11ECAA01	WW-08	1052.0	44.6	10.24	12/15/76	10.48	10/28/77	9.84	7/ 9/76	9.17	7/ 7/77	2.85	1.09	1042.1	DIETZ 2 COAL
35 44W 11ECAA02	WW-09	1051.9	21.0	12.24	12/15/76	12.24	12/15/76	9.86	7/ 9/76	9.94	7/ 7/77	2.19	2.19	1041.0	DIETZ 2 COAL
35 44W 12AAAA01	WW-04	1060.2	42.4	13.54	12/15/76	14.12	9/22/78	13.54	7/ 9/76	13.87	4/28/78	1.47	.33	1042.7	DIETZ 2 COAL
35 44W 12AAAB01	WW-05	1060.2	19.2	13.34	12/15/76	13.03	10/28/77	13.03	5/ 7/76	13.52	4/28/78	.49	.16	1046.5	DIETZ 2 CLINKER
35 44W 12ACAA01	WW-07	1059.0	14.6	8.68	12/15/76	8.99	10/27/77	7.20	8/ 7/76	8.98	10/27/77	1.79	.99	1041.7	DIETZ 2 COAL
35 44W 12ACAA02	WW-06	1059.0	13.1	8.75	12/15/76	9.12	10/28/77	7.25	8/ 7/76	9.12	10/28/77	1.87	.37	1041.7	DIETZ 2 COAL
35 44W 1BBCAC	WW-48	1070.1	71.0	24.01	12/18/76	25.34	3/22/78	24.31	8/ 9/77	25.32	4/28/78	1.01	.51	1045.5	DIETZ 2 COAL
35 44W 1BBCAB	WW-49	1070.1	46.6	24.00	12/18/76	24.00	12/18/76	23.17	8/ 3/77	24.00	4/28/78	1.00	.51	1045.5	DIETZ 2 COAL
35 43E 1BBCAA01	WW-47	1069.4	38.7	21.84	12/ 9/76	22.17	4/28/78	21.28	8/ 5/75	22.17	4/28/78	.89	.78	1046.8	DIETZ 2 COAL
35 44W 1BADD01	WW-46	1069.4	37.1	21.84	12/ 9/76	21.84	12/ 9/76	20.98	4/22/77	21.84	4/28/78	.86	.78	1046.8	DIETZ 2 COAL
35 44W 1BDAC	WW-29	1064.5	9.1	9.04	9/23/76	9.04	7/15/76	7.49	7/ 6/77	7.32	10/27/77	1.68	1.76	1057.2	ALLUVIUM
35 43E 1AAAA01	WW-30	1064.5	17.1	10.47	9/23/76	10.29	9/23/76	7.91	3/ 3/77	7.91	4/28/78	2.56	2.11	1056.6	ALLUVIUM
35 44W 1AAAA01-01	WW-86	1064.4	41.1	10.78	9/23/76	21.98	2/ 4/76	10.67	8/13/71	21.94	4/19/78	12.63	11.16	1042.5	ANDERSON-DIETZ 1 COAL COMP.
35 44W 1AAAC-01	WW-84	1063.1	41.1	11.06	9/23/76	21.98	2/ 4/76	10.94	4/21/72	21.25	4/19/78	10.31	9.88	1042.8	ANDERSON-DIETZ 1 COAL COMP.
35 44W 1ZZZC-	WW-85	1062.4	41.1	11.08	9/21/71	49.32	9/16/76	10.84	4/22/72	49.65	11/29/77	38.57	7.65	1043.7	ANDERSON-DIETZ 1 COAL COMP.
35 44W 1ZZZC-	WW-83	1062.4	41.1	12.30	9/24/71	50.29	8/ 9/77	42.34	9/26/72	49.32	4/28/78	7.91	6.96	1044.2	ANDERSON-DIETZ 1 COAL COMP.
35 44W 1AAAA01	WW-14	1059.6	70.2	12.78	9/28/77	49.38	4/19/78	48.74	9/28/77	48.84	4/19/78	36.06	36.06	1010.8	ANDERSON-DIETZ 1-DIETZ 2 COAL
35 44W 1AAAA01	WW-15	1059.6	70.2	12.78	9/28/77	3.78	9/28/77	3.37	3/22/78	3.48	4/19/78	.33	.10	1041.4	SQUIRREL CREEK ALLUVIUM
35 44W 1AAAA01	WW-13	1059.6	70.2	12.78	9/28/77	3.73	9/28/77	3.44	4/19/78	3.48	4/19/78	.25	.25	1041.5	SQUIRREL CREEK ALLUVIUM
35 44W 21ACCA01	WW-44	1076.9	56.3	27.44	9/30/77	35.27	1/22/77	27.56	9/30/77	33.74	4/28/78	7.72	6.18	1043.4	ANDERSON-DIETZ 1 COAL COMP.
35 44W 21ACBA01	WW-45	1076.9	77.7	27.44	9/30/77	28.62	4/28/78	28.62	9/30/77	28.62	4/28/78	0.00	0.00	1048.3	ANDERSON-DIETZ 1 COAL COMP.
35 44W 21ACDA	WW-43	1080.7	66.8	30.69	9/29/77	44.23	1/22/77	39.09	9/26/72	45.35	8/29/77	7.14	6.26	1045.5	ANDERSON-DIETZ 1 COAL COMP.
35 44W 21ACCA	WW-42	1080.4	51.8	32.26	11/24/78	33.27	9/15/77	32.26	11/24/78	33.27	9/15/77	1.01	1.01	1046.8	ANDERSON-DIETZ 1 COAL COMP.
35 44W 21CCA	WW-41	1078.1	54.7	28.14	9/29/77	34.39	1/22/77	28.18	9/25/72	33.94	4/28/78	7.21	5.75	1044.5	ANDERSON-DIETZ 1 COAL COMP.

LOCATION	DESIGNATION	LAND SURFACE ALTITUDE (METERS)	WELL DEPTH (METERS)	MEASURED DEPTHS TO WATER BELOW LAND SURFACE - INITIAL (METERS)	INITIAL (DATE)	MAXIMUM (METERS)	MAXIMUM (DATE)	MINIMUM (METERS)	MINIMUM (DATE)	MOST RECENT (METERS)	MOST RECENT (DATE)	TOTAL VARIATION (METERS)	NET CHANGE (METERS)	MEAN WATER SURFACE ALTITUDE (METERS)	AQUIFER
45 40E 23ACCD01	40N-12	1054.6	52.4	14.62	12/ 5/74	14.45	2/ 7/75	13.19	8/ 9/77	13.57	4/20/78	1.45	+ .05	1041.5	ANDERSON COAL
45 40E 23ACCD02	40N-13	1054.6	74.4	14.98	12/ 5/74	15.08	2/ 7/75	12.74	7/ 7/77	14.25	4/20/78	2.33	+ .65	1041.1	DIETZ 1 COAL
45 40E 23ACCD03	40N-14	1055.6	104.2	4.80	12/ 5/74	4.70	10/27/77	3.40	9/19/75	3.91	4/20/78	.48	+ .89	1051.2	DIETZ 2 COAL
45 40E 24AACA01	40N-16	1052.2	134.5	17.98	12/ 6/74	17.40	2/ 7/75	16.43	2/ 6/76	16.49	4/20/78	1.47	+ 1.49	1035.5	ANDERSON COAL
45 40E 24AACD01	40N-17	1054.7	74.7	16.70	12/ 5/74	16.70	12/ 5/74	15.91	9/ 9/77	16.21	4/20/78	1.88	+ 1.49	1037.5	SMITH COAL
45 40E 24AACD02	40N-18	1049.1	114.3	13.33	12/ 5/74	13.34	9/19/75	13.11	2/ 6/76	13.23	4/20/78	.23	+ .09	1035.8	ANDERSON COAL (HOOKEN CASING)
45 40E 24AACD03	40N-19	1049.1	74.7	14.01	12/ 5/74	13.95	12/11/75	13.91	11/ 6/74	14.04	4/20/78	.13	+ .03	1035.1	DIETZ COAL
45 40E 24ACAA01	40N-20	1047.6	74.4	14.87	12/ 5/74	14.87	12/ 5/74	13.96	2/ 6/76	14.22	4/20/78	1.18	+ .65	1033.4	ANDERSON COAL
45 40E 24ACAA02	40N-21	1047.6	74.4	14.17	12/ 5/74	14.21	1/ 7/76	13.63	9/ 9/77	14.28	4/17/78	.61	+ .61	1033.4	ANDERSON COAL (PACKER FAILED AT 74)
45 40E 24ADAA01	40N-22	1047.6	74.4	14.21	12/ 5/74	14.21	12/ 5/74	13.76	2/ 6/76	14.10	4/20/78	.41	+ .47	1033.5	ANDERSON COAL
45 40E 24BAAC01	40N-17	1049.1	41.6	14.81	9/ 9/74	15.91	12/11/75	13.98	11/ 6/74	14.54	4/20/78	1.93	- .50	1034.6	ANDERSON-DIETZ 1-DIETZ 2 COAL
45 40E 24BAAC02	40N-18	1049.1	104.8	13.22	12/ 5/74	13.34	9/20/77	12.82	7/ 7/77	13.54	4/20/78	.52	- .32	1035.7	ANDERSON-DIETZ 1-DIETZ 2 COAL
45 40E 24BCAA01	40N-20	1051.8	14.2	7.24	9/27/77	7.24	12/20/77	6.98	4/20/78	6.98	4/20/78	.26	+ .26	1071.8	SQUIRREL CREEK ALLUVIUM
45 40E 25CACC01	40N-24	1074.5	14.2	3.61	9/27/77	3.61	9/27/77	3.36	4/20/78	3.36	4/20/78	.25	+ .25	1070.7	SQUIRREL CREEK ALLUVIUM
45 40E 25CACC02	40N-25	1074.9	14.9	5.17	9/27/77	5.17	9/27/77	5.32	4/20/78	5.32	4/20/78	.45	+ .45	1070.3	SQUIRREL CREEK ALLUVIUM
45 40E 25CACC03	40N-26	1074.9	14.9	7.74	9/27/77	7.74	9/27/77	7.48	4/20/78	7.48	4/20/78	.26	+ .26	1071.2	SQUIRREL CREEK ALLUVIUM
45 40E 25CBAA01	40N-24	1072.1	17.4	3.04	9/27/77	3.04	9/27/77	2.76	4/20/78	2.76	4/20/78	.49	+ .49	1068.8	SQUIRREL CREEK ALLUVIUM
45 40E 25BAAA01	40N-23	1069.4	14.6	1.78	9/27/77	1.78	9/27/77	1.21	4/20/78	1.21	4/20/78	.49	+ .49	1071.4	SQUIRREL CREEK ALLUVIUM
45 40E 32ACAA01	40N-24	1064.8	19.2	2.64	9/27/77	2.64	9/27/77	2.47	4/19/78	2.47	4/19/78	.18	+ .18	1062.0	SQUIRREL CREEK ALLUVIUM
45 41E 32CCC1	40N-27	1064.2	17.1	7.49	12/11/74	7.49	12/11/74	6.93	2/ 6/76	6.93	4/20/78	.56	+ .52	1057.9	ANDERSON-CLINKER
45 41E 30ACAA	40N-23	1064.1	12.5	12.17	12/11/74	12.91	9/19/75	12.28	2/22/77	12.38	4/20/78	.71	+ .38	1051.5	DIETZ 2 COAL
45 41E 31CCCA01	40N-24	1062.7	14.9	10.34	12/11/74	10.34	12/11/74	10.08	4/20/78	10.08	4/20/78	.26	+ .26	1052.5	DIETZ 2 COAL
45 41E 30CCAD2	40N-25	1061.9	14.7	10.67	12/11/74	10.85	11/19/76	10.24	4/20/78	10.24	4/20/78	.61	+ .38	1051.2	ANDERSON COAL
45 41E 30DDCA	40N-26	1062.1	14.9	9.97	12/11/74	9.97	12/11/74	9.70	4/20/78	9.70	4/20/78	.27	+ .27	1052.1	ALLUVIUM
45 41E 29CACC01	40N-27	1074.1	22.9	13.38	12/11/74	14.12	12/13/76	13.36	12/15/74	13.61	4/20/78	.76	+ .24	1060.4	ANDERSON COAL
45 41E 29CBCD2	40N-28	1074.5	44.6	14.52	12/11/74	14.62	12/11/77	13.74	9/19/76	14.04	4/20/78	.88	+ .49	1059.2	DIETZ 2 COAL
45 41E 29CAA1	40N-29	1073.9	44.1	22.86	12/11/77	23.46	12/15/76	22.70	12/13/76	23.13	4/20/78	.91	+ .27	1050.8	DIETZ 2 COAL
45 42E 31DDDA	39N-29	1070.8	45.4	44.24	9/22/76	44.24	9/22/76	44.19	5/ 4/77	44.21	9/22/76	.07	+ .05	1026.6	ANDERSON COAL
45 43E 24DDDA01	39N-27	1111.1	46.3	47.70	9/22/76	48.75	9/22/76	48.03	10/12/77	48.03	10/12/77	2.71	+ 2.71	1067.3	DIETZ COAL
45 43E 24DDDB02	39N-27	1111.1	44.2	38.37	9/22/76	38.37	9/22/76	38.25	2/15/77	38.37	10/12/77	1.34	+ .81	1079.5	ANDERSON COAL
45 43E 36CCCD01	39N-28	1075.9	48.2	29.06	6/ 5/74	27.81	9/22/76	29.06	6/ 5/74	27.81	9/22/76	1.25	- 1.25	1049.6	CANYON COAL
45 43E 36CCDD01	39N-29	1074.9	48.2	9.29	9/22/76	9.38	9/22/76	9.20	4/13/77	9.20	4/13/77	.18	+ .09	1064.7	DIETZ COAL
45 43E 12AACC01	39N-25	1091.2	14.6	1.85	9/28/77	2.28	11/11/77	1.85	9/28/77	2.28	11/11/77	1.23	+ 1.23	1090.3	ANDERSON COAL
45 43E 12AACC02	39N-26	1091.2	14.6	1.04	9/28/77	1.04	9/28/77	1.04	9/28/77	1.04	9/28/77	0.00	0.00	1090.2	FAST FORK TR. CR. ALLUVIUM
45 43E 12ACDA01	39N-27	1094.2	9.8	2.52	8/ 1/77	2.54	11/11/77	2.49	9/19/77	2.94	11/11/77	.45	- .44	1091.6	FAST FORK TR. CR. ALLUVIUM
45 43E 12ACDA02	39N-28	1094.2	9.8	4.54	12/11/77	4.54	12/11/77	4.54	11/11/77	4.54	11/11/77	0.00	0.00	1089.7	FAST FORK TR. CR. ALLUVIUM
45 43E 13ACCA01	39N-27	1089.7	11.9	7.60	11/11/77	7.60	11/11/77	7.60	11/11/77	7.60	11/11/77	0.00	0.00	1089.9	FAST FORK TR. CR. ALLUVIUM
45 43E 13ACAA	39N-28	1090.1	9.4	4.04	9/28/77	4.04	9/28/77	4.04	9/28/77	4.04	9/28/77	0.00	0.00	1086.1	ANDERSON COAL
45 43E 13CAAA01	39N-26	1089.4	54.1	19.51	8/ 5/77	20.10	9/22/76	19.51	8/ 5/77	20.10	9/22/76	.59	- .59	1069.3	DIETZ COAL
45 43E 13CAAA02	39N-27	1090.1	11.3	5.31	9/28/77	5.31	9/28/77	5.31	9/28/77	5.56	9/22/76	.25	+ .25	1084.7	ANDERSON COAL
45 43E 14ADDA	39N-27	1130.8	80.5	46.84	2/15/77	41.97	8/ 5/77	39.17	8/ 5/77	41.97	8/ 5/77	2.80	+ 1.31	1090.1	ANDERSON COAL
45 43E 21ADDA01	39N-28	1101.9	69.8	31.99	8/ 5/77	31.99	8/ 5/77	31.81	5/27/76	31.87	9/22/76	.14	+ .08	1070.0	ANDERSON-DIETZ INTERMURDEN
45 43E 21ADDB02	39N-28	1101.9	41.1	15.63	8/ 5/77	15.63	8/ 5/77	15.46	5/27/76	15.51	9/22/76	.15	+ .11	1084.3	ANDERSON COAL
45 43E 22ACCA	39N-25	1097.3	39.1	8.88	9/22/76	8.88	9/22/76	8.79	4/13/77	8.82	10/11/77	.09	+ .06	1088.4	ANDERSON COAL
45 43E 25DABA	39N-25	1097.1	114.3	12.57	10/12/77	12.57	10/12/77	12.57	10/12/77	12.73	10/12/77	.16	+ .16	1084.4	ANDERSON COAL
45 44E 08AACC01	39N-23	1134.9	57.6	41.91	9/21/76	41.94	5/12/77	41.68	4/19/77	41.70	10/19/77	.46	+ .21	1095.1	ANDERSON COAL
45 44E 08ACCD	39N-24	1127.4	16.1	DRY	10/ 9/76	DRY	10/ 9/76	DRY	10/ 9/76	DRY	10/ 9/76	- -	- -	1106.1	DIETZ COAL
45 44E 26AAA	39N-32	1108.1	6.7	1.34	11/11/77	1.34	11/11/77	1.34	11/11/77	1.34	11/11/77	0.00	0.00	1089.8	FAST FORK TR. CR. ALLUVIUM
45 44E 26AAA	39N-33	1108.1	6.7	1.34	11/11/77	1.34	11/11/77	1.34	11/11/77	1.35	11/11/77	0.00	0.00	1089.8	FAST FORK TR. CR. ALLUVIUM
45 44E 26AAD	39N-34	1108.1	6.2	1.34	8/ 7/77	1.40	8/ 8/77	1.34	11/11/77	1.34	11/11/77	.06	0.00	1089.8	FAST FORK TR. CR. ALLUVIUM
45 44E 26DDCA1	39N-29	1121.7	41.1	18.35	5/12/77	19.03	8/ 1/77	18.31	10/11/77	18.31	10/11/77	.71	+ .04	1103.4	DIETZ COAL
45 44E 26DDCB2	39N-28	1121.7	40.2	16.92	5/12/77	17.28	9/22/76	16.92	5/12/77	17.04	10/11/77	.36	+ .12	1104.6	ANDERSON COAL
45 44E 26DDCB3	39N-29	1121.7	39.3	17.10	5/12/77	17.28	9/22/76	16.74	4/13/77	16.74	10/12/77	.54	+ .18	1104.7	ANDERSON COAL
45 44E 27ACCD01	39N-29	1101.9	29.7	14.16	9/27/77	14.16	9/27/77	14.16	9/27/77	14.16	9/27/77	0.00	0.00	1087.7	ANDERSON COAL
45 44E 27ACCD02	39N-30	1102.8	29.4	14.90	9/27/77	14.90	9/27/77	14.90	9/27/77	14.90	9/27/77	0.00	0.00	1087.9	ANDERSON COAL
45 44E 28ACCD03	39N-29W	1101.6	29.4	15.71	5/12/77	15.71	5/12/77	13.92	9/27/77	13.96	10/12/77	1.79	+ 1.75	1087.2	ANDERSON COAL
45 44E 33ACCD4	39N-29E	1103.1	27.4	12.73	9/27/77	12.73	9/27/77	12.73	9/27/77	12.73	9/27/77	0.00	0.00	1087.6	ANDERSON COAL
45 44E 34ABAA01	39N-29	1119.6	54.9	29.41	9/21/76	32.30	4/13/77	29.41	9/21/76	30.91	10/12/77	2.89	- 1.50	1087.9	DIETZ COAL
45 44E 34BAAA02	39N-29	1119.6	54.5	16.41	9/21/76	17.10	8/ 8/77	16.41	9/21/76	16.95	10/12/77	.54	- .36	1101.9	ANDERSON COAL
45 44E 34DDDD	39N-30	1127.8	74.1	8.22	9/22/76	8.37	4/13/77	8.18	10/12/77	8.18	10/12/77	.27	+ .12	1121.6	ANDERSON COAL
45 44E 9CCAA	39N-31	1121.7	39.6	8.84	8/ 8/77	10.56	10/12/77	8.84	8/ 8/77	10.56	10/12/77	1.72	- 1.72	1111.7	FAST FORK TR. CR. ALLUVIUM
45 44E 9CCAA	39N-30	1127.8	56.7	10.46	8/ 7/77	10.46	8/ 7/77	13.72	10/12/77	13.72	10/12/77	2.74	+ 2.74	1113.1	ANDERSON COAL
45 44E 17CAD	39N-29	1104.0	13.1	9.41	8/ 2/77	9.41	9/28/77	4.81	4/18/78	4.81	4/18/78	4.60	+ .42	1163.5	LITTLE THUMBS CREEK ALLUVIUM
44N 44W 23ABBC	WR-39	1117.6	9.1	4.93	8/ 2/77	15.51	4/18/78	4.93	8/ 2/77	15.51	4/18/78	.58	- .58	1102.2	ANDERSON-DIETZ 1 AND 2 COAL
44N 44W 23ADCB01	WR-38	1129.6	87.2	14.72	6/23/77	19.58	4/18/78	14.72	6/23/77	19.58	4/18/78	4.86	- 4.86	1109.6	DIETZ 1 AND DIETZ 2 COAL BEDS
44N 44W 23ACAD02	WR-48	1125.9	50.9	12.84	7/ 6/77	12.87	8/ 2/77	12.40	3/21/78	12.72	4/18/78	.47	- .07	1113.1	ANDERSON COAL BED

APPENDIX B

Summaries of Water-Level Measurements in Mine-Spoils Aquifers

LOCATION	DESIGNATION	LAND SURFACE ALTITUDE (METERS)	WELL DEPTH (METERS)	MEASURED DEPTHS TO WATER BELOW LAND SURFACE — INITIAL (METERS)	INITIAL (DATE)	MAXIMUM (METERS)	MAXIMUM (DATE)	MINIMUM (METERS)	MINIMUM (DATE)	MOST RECENT (METERS)	MOST RECENT (DATE)	TOTAL VARIATION (METERS)	NET CHANGE (METERS)	MEAN WATER SURFACE ALTITUDE (METERS)	AQUIFER
1N 41E 2MCA01	S-10	991.4	11.4	DRY	9/20/39	DRY	1/14/76	11.82	3/30/76	11.16	4/11/78	.58	< .44	979.8	ROSEMOUNT SPOILS
1N 41E 1MCA02	S-09	994.7	9.2	9.30	10/20/39	DRY	1/14/76	8.49	5/ 8/75	8.87	4/11/78	1.74	< .43	986.4	ROSEMOUNT SPOILS
1N 41E 1BCA04	S-08	994.9	9.8	7.43	3/12/76	DRY	10/14/77	7.29	4/23/76	DRY	10/14/77	2.46	< 2.33	< 992.1	ROSEMOUNT-MCKAY SPOILS
1N 41E 2BAA01	MS-04	1004.4	13.7	DRY	4/ 4/77	DRY	4/14/78	DRY	4/13/78	DRY	4/13/78	- -	- -	990.6	ROSEMOUNT-MCKAY SPOILS
1N 41E 2DCA1A	MS-02	1005.8	14.3	15.24	4/ 4/77	15.24	4/ 4/77	14.72	4/13/78	14.72	4/13/78	.52	< .52	990.8	ROSEMOUNT SPOILS
1N 41E 2DCA1B	MS-01	998.4	12.2	14.14	10/ 1/75	14.84	7/21/76	13.79	4/13/78	13.79	4/13/78	.95	< .95	984.9	ROSEMOUNT SPOILS
1N 41E 2MCA03	MS-07	995.2	14.6	14.24	4/ 5/77	14.24	4/ 5/77	14.05	4/12/78	14.05	4/12/78	1.28	< 1.28	979.4	ROSEMOUNT-MCKAY SPOILS
1N 41E 2DCA1C	MS-03	997.1	14.9	14.88	4/29/77	14.88	4/29/77	13.77	4/12/78	13.77	4/12/78	1.22	< 1.22	977.8	ROSEMOUNT-MCKAY SPOILS
1N 41E 2BCA1A	MS-1A	992.1	14.6	10.48	4/ 5/77	10.48	4/ 5/77	9.71	4/12/78	9.71	4/12/78	1.49	< 1.49	982.3	ROSEMOUNT-MCKAY SPOILS
1N 41E 2BCA1B	MS-1B	992.1	20.4	23.14	10/ 1/75	23.44	5/14/76	22.39	4/ 2/77	23.31	4/13/78	1.25	< .11	985.4	ROSEMOUNT SPOILS
1N 41E 2MCA02	MS-05	1004.1	23.8	16.48	10/ 1/75	17.04	7/21/76	15.19	5/ 4/77	15.92	4/13/78	1.85	< .78	995.1	ROSEMOUNT SPOILS
1N 41E 2MCA01	MS-06	1001.5	23.4	DRY	10/20/75	DRY	4/12/76	DRY	4/12/78	DRY	4/12/78	- -	- -	< 979.6	ROSEMOUNT-MCKAY SPOILS
1N 41E 2MBA02	S-1A	990.0	10.4	DRY	12/29/76	DRY	3/ 3/77	DRY	3/ 3/77	DRY	3/ 3/77	- -	- -	< 981.6	ROSEMOUNT-MCKAY SPOILS
1N 41E 2MBA01	S-1B	995.2	13.1	28.04	4/19/76	28.04	4/19/76	15.31	4/12/78	15.31	4/12/78	4.78	< 4.78	980.1	ROSEMOUNT-MCKAY SPOILS
1N 41E 2BAA02	MS-09	998.2	23.9	15.84	5/19/76	16.44	8/19/76	14.30	4/25/78	16.04	8/19/76	.45	0.00	974.7	ROSEMOUNT SPOILS
1N 41E 2MCA4	MS-11	998.4	20.4	19.84	5/19/76	19.84	5/19/76	19.41	4/12/78	19.41	4/12/78	2.33	0.00	978.5	ROSEMOUNT SPOILS
1N 41E 2MCA5	MS-14	998.8	21.3	13.16	4/ 5/77	14.94	8/19/76	11.61	4/12/78	11.61	4/12/78	5.38	< 5.38	988.4	ROSEMOUNT SPOILS
1N 41E 2CDA1A	MS-21	999.2	20.4	18.06	8/19/76	18.06	8/19/76	14.82	4/12/78	14.82	4/12/78	2.95	< 2.95	979.9	ROSEMOUNT-MCKAY SPOILS
1N 41E 2DCA1A	MS-13A	998.7	20.4	17.44	4/ 5/77	19.77	8/19/76	14.14	4/12/78	14.14	4/12/78	5.63	< 5.63	984.7	ROSEMOUNT SPOILS
1N 41E 2DCA1C	MS-13B	997.9	20.1	19.77	8/19/76	19.77	8/19/76	14.14	4/12/78	14.14	4/12/78	5.63	< 5.63	< 984.4	RED SPOT SPOILS
1N 41E 2DCA1C01	MS-24	995.9	14.6	NO	7/29/76	NO	4/12/78	DRY	4/12/78	DRY	4/12/78	- -	- -	< 979.4	ROSEMOUNT SPOILS
1N 41E 2BCA1C	MS-23	995.7	30.5	14.90	4/ 4/77	14.90	4/ 4/77	12.27	4/12/78	12.27	4/12/78	2.63	< 2.63	983.4	ROSEMOUNT SPOILS
1N 41E 1BCA1C	S-02	992.7	14.9	10.97	10/23/75	11.27	1/19/76	10.21	4/12/78	10.21	4/12/78	1.81	< .76	977.0	ROSEMOUNT SPOILS
1N 41E 1BAA01	S-01	987.4	14.6	12.72	10/23/75	12.98	8/ 5/76	12.17	4/19/78	12.37	4/12/78	.61	< .35	974.8	ROSEMOUNT SPOILS
1N 40E 1MAA01	S-03	987.4	14.6	12.72	10/23/75	12.98	8/ 5/76	12.17	4/19/78	12.43	4/12/78	1.26	< 1.26	971.4	ROSEMOUNT SPOILS
1N 40E 1MDA01	EPA-12	978.2	10.1	8.78	12/10/76	8.78	12/10/76	5.42	4/12/78	6.08	4/12/78	3.12	< 3.12	971.4	ROSEMOUNT SPOILS
1N 40E 1MDA02	EPA-10	977.7	9.4	8.71	12/10/76	8.71	12/10/76	5.48	4/12/78	5.48	4/12/78	3.12	< 3.12	971.4	ROSEMOUNT SPOILS
1N 40E 1MDA03	EPA-02	975.4	8.2	6.88	12/10/76	6.88	12/10/76	3.61	1/17/78	3.61	1/17/78	2.56	< 2.56	971.4	ROSEMOUNT SPOILS
1N 40E 1MDA04	EPA-01	975.4	6.4	6.09	12/10/76	6.09	12/10/76	3.29	1/17/78	3.29	1/17/78	2.65	< 2.65	971.5	ROSEMOUNT SPOILS
1N 40E 1MDA05	EPA-04	975.4	6.4	5.93	12/10/76	5.93	12/10/76	3.24	1/17/78	3.24	1/17/78	2.68	< 2.68	971.5	ROSEMOUNT SPOILS
1N 40E 1MDA06	EPA-06	975.4	6.4	6.04	12/10/76	6.04	12/10/76	3.34	11/14/77	3.34	1/17/78	2.70	< 2.70	972.1	ROSEMOUNT SPOILS
1N 40E 1MDA07	EPA-05	974.7	6.7	7.04	12/10/76	7.04	12/10/76	3.76	8/19/76	3.88	1/17/78	3.52	< 3.52	971.9	ROSEMOUNT SPOILS
1N 40E 1MDA08	EPA-08	974.8	7.0	NOT	12/10/76	NOT	12/10/76	2.41	8/19/76	2.41	1/17/78	4.87	< 4.87	971.9	ROSEMOUNT SPOILS
1N 40E 1MDA09	EPA-09	974.7	7.3	6.56	12/10/76	6.86	4/ 4/77	3.79	8/19/76	3.79	1/17/78	3.40	< .76	971.2	WEST DECKER SPOILS - AREA F
1N 40E 1NCA02	MS-05M	1040.5	42.7	27.23	4/22/76	27.23	4/22/76	25.44	11/29/77	26.19	4/19/78	1.44	< 2.29	1041.3	ANDERSON-DIETZ 1 SPOILS
1N 40E 1NCA03	MS-05C	1040.5	24.1	24.41	4/22/76	DRY	4/ 4/77	24.41	4/22/76	28.19	4/19/78	3.44	< 2.29	1041.3	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCA01	MS-03	1042.0	19.2	16.37	4/22/76	16.37	4/22/76	7.74	7/ 5/77	11.14	4/19/78	8.63	< 7.23	1034.4	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCA04	MS-04	1042.0	20.4	18.49	4/22/76	18.49	4/22/76	13.14	5/ 4/77	13.24	4/19/78	5.25	< 5.25	1033.4	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH04	MS-04A	1042.0	20.4	20.42	4/ 5/77	24.15	4/ 4/77	16.15	3/22/78	17.98	4/19/78	10.80	< 7.44	1032.7	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH03	MS-04B	1044.0	20.4	20.42	4/ 5/77	24.13	4/ 4/77	16.08	3/22/78	17.90	4/19/78	10.80	< 8.11	1033.5	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH02	MS-04C	1044.0	20.4	19.84	4/22/76	19.98	4/19/78	16.08	3/22/78	17.90	4/19/78	1.49	< 1.49	1037.4	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH01	MS-04D	1044.0	20.4	19.84	4/22/76	19.45	4/19/78	15.94	3/22/78	17.45	4/19/78	1.49	< 1.49	1037.3	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH05	MS-04M	1045.5	22.6	8.71	4/22/76	8.71	4/22/76	.74	2/18/77	6.27	4/19/78	5.46	< 5.46	1039.3	WEST DECKER SPOILS - SCR. PIT
1N 40E 1NCH07	MS-04E	1045.5	19.8	12.93	4/22/76	12.93	4/22/76	4.26	7/ 5/77	11.14	4/19/78	8.15	< 1.79	1035.7	ANDERSON-DIETZ 1 SPOILS
1N 40E 1AHA01	MS-08A	1071.4	47.9	37.94	4/22/76	39.17	7/15/76	27.28	4/19/78	27.28	4/19/78	5.89	< 5.66	1043.7	ANDERSON-DIETZ 1 SPOILS
1N 40E 1AHA02	MS-08B	1071.4	34.4	31.62	7/15/76	31.62	7/15/76	30.09	4/19/78	30.09	4/19/78	1.73	< 1.73	1040.2	ANDERSON-DIETZ 1 SPOILS

APPENDIX C

Results of Aquifer Tests Conducted on Undisturbed Coal Beds

LOCATION	DESIGNATION	CALCULATED TRANSMISSIVITY (SQUARE METERS/DAY)	IMPLIED HYDRAULIC CONDUCTIVITY (METERS/DAY)	WATER QUALITY SAMPLED	TYPE OF AQUIFER TEST
2N 41E 36AAA01	S-12	9.60	1.83	YES	SINGLE WELL / BAILER RECOVERY
2N 41E 36AAH02	S-13	.100	.030	YES	SINGLE WELL / BAILER RECOVERY
1N 37E 36AHA01	A-4	.010	.001	YES	SINGLE WELL / DRAWDOWN
1N 37E 36ADA02	A-8	.200	.020	YES	SINGLE WELL / DRAWDOWN
1N 38E 19CBH02	B-8	.040	.006	YES	SINGLE WELL / DRAWDOWN
1N 38E 31DDA02	B-3	.400	.040	YES	SINGLE WELL / DRAWDOWN
1N 38E 31DHA03	B-C	.040	.006	YES	SINGLE WELL / DRAWDOWN
1N 40E 13CCH03	S-24	.400	.080	YES	SINGLE WELL / BAILER RECOVERY
1N 41E 19AAC01	S-27	1.40	.390	YES	SINGLE WELL / BAILER RECOVERY
1N 41E 19ADC02	S-28	158.	20.7	YES	SINGLE WELL / DRAW. AND RECOV.
1N 41E 19ABA02	S-29	.500	.060	YES	SINGLE WELL / DRAW. AND RECOV.
1N 41E 21DAD02	WS-4A	4.40	.730	YES	SINGLE WELL / DRAW. AND RECOV.
1N 42E 31ADA01	EXA-01	.780	.240	NO	SINGLE WELL / BAILER RECOVERY
1N 42E 31DAA03	EXA-07	.800	.020	NO	SINGLE WELL / BAILER RECOVERY
2S 44E 34AAA02	WC-4	6.80	.790	YES	SINGLE WELL / DRAW. AND RECOV.
2S 44E 34AAA01	WC-11	1.70	.360	YES	SINGLE WELL / DRAW. AND RECOV.
4S 38E 3DD4HC	W-21	5.40	.380	YES	SINGLE WELL / DRAW. AND RECOV.
4S 40E 34DHD01	WC-10	5.50	.900	YES	SINGLE WELL / DRAWDOWN
4S 44E 27DDA5	WC-20	14.6	1.54	YES	SINGLE WELL / DRAW. AND RECOV.
4S 45E 4DACC	RC-04	.200	.030	YES	SINGLE WELL / DRAW. AND RECOV.
4S 45E 10DHC01	RC-05	1.90	.250	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 1AADC	W-23	4.10	.260	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 19CCA01	S-W/FPA-01	7.10	.450	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 19CCA02	S-W/FPA-02	7.40	.940	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 29DADC	S-W-301	1.80	.110	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 23CDAD	S-W-308	7.40	.520	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 24AAHC	S-W-306	16.8	1.10	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 25ACBA	S-W-304	3.10	.230	YES	SINGLE WELL / DRAWDOWN
5S 39E 24AAAH	S-W-309	3.70	.250	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 27ACBH	S-W-22A	.500	.150	YES	SINGLE WELL / DRAWDOWN
5S 39E 24CCA01	W-24	4.80	.320	YES	SPECIFIC CAPACITY
5S 39E 24CCA02	W-27	1.10	.150	YES	SPECIFIC CAPACITY
5S 39E 29AA01	W-24	4.50	.990	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 32ACAA	W-33	310.	14.5	YES	SPECIFIC CAPACITY
5S 39E 32BDAD	W-44	.900	.060	YES	SINGLE WELL / DRAW. AND RECOV.
5S 39E 33DAHD	W-27	1.60	.070	YES	SINGLE WELL / DRAW. AND RECOV.
5S 40E 30AAA01	W-11	0.10	1.33	YES	SINGLE WELL / DRAWDOWN
5S 40E 4AAB01	W-15	1.90	.470	YES	SINGLE WELL / DRAWDOWN
5S 40E 9DCA01	DS-7A	12.8	2.20	YES	SINGLE WELL / DRAWDOWN
5S 40E 11CCF01	W-17	41.0	8.96	YES	SINGLE WELL / DRAW. AND RECOV.
5S 40E 17AHA01	WC-05	20.8	4.58	YES	SINGLE WELL / DRAW. AND RECOV.
5S 40E 17ADC	W-08	.400	.140	YES	SINGLE WELL / DRAWDOWN
5S 40E 17BCC	W-18	1.50	.310	YES	SINGLE WELL / DRAWDOWN
5S 40E 17DCC	W-11	2.40	.320	YES	SINGLE WELL / DRAWDOWN
5S 40E 18AADC01	W-24	11.8	.870	YES	SINGLE WELL / DRAWDOWN
5S 40E 18ACD02	W-07	4.10	1.24	YES	SINGLE WELL / DRAWDOWN
5S 40E 23CCD01	W-19	1.90	.490	YES	SINGLE WELL / BAILER RECOVERY
5S 40E 23CCD02	W-19	14.3	3.47	YES	SINGLE WELL / DRAWDOWN
5S 40E 23CAA	W-14	.700	.160	YES	SINGLE WELL / DRAWDOWN
5S 40E 24AAC	W-16	9.50	.270	YES	SINGLE WELL / DRAWDOWN
5S 40E 24AAC03	W-17	2.60	.540	YES	SINGLE WELL / DRAWDOWN
5S 40E 3CWD03	W-02	6.80	1.05	YES	SINGLE WELL / DRAWDOWN
5S 40E 3CWD04	W-03	7.40	1.84	YES	SINGLE WELL / DRAW. AND RECOV.
5S 40E 12ADC03	W-06	2.40	.290	YES	SINGLE WELL / DRAWDOWN
5S 41E 13DCAA	W-17	10.7	1.47	YES	SINGLE WELL / DRAW. AND RECOV.
5S 41E 22ACCA	W-19	41.0	5.28	YES	SINGLE WELL / DRAW. AND RECOV.
5S 44E 7ADDC01	W-20	.200	.065	YES	SINGLE WELL / DRAWDOWN
5S 44E 7ADDC03	W-20	.150	.017	YES	SINGLE WELL / DRAW. AND RECOV.
5S 44E 7ABAB01	W-29	1.20	.130	YES	DRAW. AND RECOV. WITH OBSERVATION WELL(S)
5S 44E 7ACC02	W-28A	1.13	.120	NO	OBSERVATION WELL / DRAW. AND RECOV.
5S 44E 7ABDL3	W-28A	1.12	.110	NO	OBSERVATION WELL / DRAW. AND RECOV.
5S 44E 7ADCD4	W-28C	1.12	.110	NO	OBSERVATION WELL / DRAW. AND RECOV.
5S 44E 8ABBA02	W-2A	13.4	1.93	YES	SINGLE WELL / DRAW. AND RECOV.
5S 44E 8ADDD	W-2B	4.40	.990	YES	OTHER
6N 44E 33AAC	W-30	2.60	.110	YES	SINGLE WELL / DRAW. AND RECOV.
6N 44E 33AAE-01	W-34	2.60	.110	YES	SINGLE WELL / DRAW. AND RECOV.
6N 44E 33ACE-03	W-34	2.20	.240	YES	SINGLE WELL / DRAWDOWN

APPENDIX D

Concentrations of Major Chemical Constituents in Spoils Waters

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
2N 41E 34DDAD	W-2	8.2	7.25	993.	3-23-73		401.	748.	23.	11.1	.30	4.70	36.4
2N 41E 35ACDA	W-3	7.0	5.06	993.	3-23-73		347.	280.	52.	14.6	.40	.32	51.3
2N 41E 35CBAA	W-5	17.1	11.89	998.	3-23-73		380.	477.	81.	13.5	1.10	5.00	40.6
1N 37E 25RCAD	SS-1	39.3	32.92	1000.	2- 7-78	13.0	199.	119.	237.	11.0	.03	.21	10.3
1N 41E 18CAB 1	S-10	11.6	11.03	991.	3-30-78	14.0	580.	358.	109.	13.1	.80	.91	22.9
1N 41E 10DAC 2	S-09	8.2	6.77	989.	3-30-78	12.0	404.	318.	83.	6.9	.02	.02	16.5
1N 41E 3AABB	W-4	9.8		995.	7-20-77	15.0	318.	254.	53.	19.4	.39	1.33	13.9
1N 41E 3AAAB	W-4	9.8	8.29	995.	11-18-76	11.0	436.	400.	85.	17.7	.02	1.44	13.5
1N 41E 3AARR	W-4	9.8	7.37	995.	6- 3-76	14.0	389.	398.	77.	15.5	.07	.96	13.2
1N 41E 3AARR	W-4	9.8	7.40	995.	4- 6-76	12.5	315.	307.	63.	15.8	1.29	.86	11.3
1N 41E 3AARR	W-4	9.8	7.43	995.	1-12-76	10.0	357.	347.	70.	19.5	.03	.86	13.3
1N 41E 3AARR	W-4	9.8	7.99	995.	10- 1-75		285.	282.	65.	20.0	.48	.64	13.6
1N 41E 3AARR	W-4	8.2	7.77	993.	5-23-74	11.5	497.	731.	170.	15.8	.03	.37	14.0
1N 41E 3AARR	W-4	9.8	7.99	995.	3-23-73		333.	317.	58.	12.0	.15	2.20	44.9
1N 41E 22DAA	BS-40	18.3	14.87	1006.	3-28-78	13.0	95.	168.	65.	5.0	.03	.34	15.6
1N 41E 22DAA	BS-40	18.3		1006.	10-19-77	14.0	125.	173.	59.	5.8	.04	.04	15.4
1N 41E 27ARCC 3	BS-22	17.7	15.42	1000.	3-28-78	11.5	440.	711.	730.	11.6	.06	2.48	15.1
1N 41E 27ARCC 3	BS-22	17.7	15.92	999.	7-21-77	12.0	440.	690.	746.	11.9	.06	2.56	13.0
1N 41E 27ARCC 3	BS-22	17.7	15.51	1000.	2-19-77	11.0	388.	675.	780.	12.4	.08	1.52	12.5
1N 41E 27ARCC 3	BS-22	17.7	15.56	1000.	6- 4-76	11.5	454.	688.	790.	12.5	.02	1.95	11.2
1N 41E 27ARCC 3	BS-22	17.7	15.39	1000.	4- 5-76	12.0	430.	725.	813.	12.0	.77	2.84	11.0
1N 41E 27ACCC	BS-37	19.5	15.42	995.	3-28-78	10.0	460.	692.	420.	21.2	.07	5.65	15.0
1N 41E 27ADCA	BS-36	15.8	14.08	992.	3-28-78	12.5	568.	606.	127.	22.8	.10	6.90	17.2
1N 41E 27ADDC	BS-35	24.4	9.45	992.	3-28-78	12.0	412.	326.	156.	14.5	.05	.83	13.7
1N 41E 27BADC 2	BS-18	32.6	23.16	100A.	3-28-78	14.0	310.	300.	200.	11.5	.04	.47	14.8
1N 41E 27BADC 3	BS-19	23.8	15.45	1002.	3-28-78	14.0	372.	494.	204.	21.4	.04	.66	13.4
1N 41E 27BADC 3	BS-19	22.6	16.01	1002.	7-21-77	14.5	332.	472.	225.	19.0	.05	1.27	14.0
1N 41E 27BADC 3	BS-19	23.8	16.77	1002.	4- 5-76	14.5	383.	455.	182.	22.0	.05	1.57	13.0
1N 41E 27DAA8 2	BS-29	43.9	16.43	99A.	3-28-78	12.5	366.	326.	122.	17.6	.21	1.18	20.0
1N 41E 27DACA	TW-01	22.9	15.24	993.	3-28-78	11.0	390.	350.	146.	16.2	.03	1.71	11.4
1N 41E 27DACA	TW-1	22.9	17.16	993.	4-13-76	10.5	405.	358.	116.	16.0	.03	1.56	9.6
1N 41E 27DADC	BS-34	21.3	11.40	991.	3-28-78	13.0	344.	382.	131.	14.1	.08	.55	15.0
1N 41E 27DADC	BS-34	21.3	12.45	991.	7-21-77	13.5	368.	400.	127.	14.5	.02	.50	12.4
1N 41E 27DBAD	BS-27	26.8	13.11	995.	3-28-78	12.5	320.	336.	119.	17.5	.03	.71	12.6
1N 41E 27DBAD	BS-27	26.8	14.79	995.	2- 4-77	13.0	335.	314.	122.	17.2	.32	.65	10.1
1N 41E 27DBDA	BS-3A	25.6	15.42	997.	3-28-78	13.0	358.	330.	123.	21.0	.03	1.38	9.7
1N 41E 27DBDC	BS-2A	32.3	15.85	998.	3-28-78	11.0	312.	300.	113.	16.0	.03	1.03	10.7
1N 41E 27DBDC	BS-2A	32.3	16.93	998.	7-21-77	11.5	334.	312.	115.	16.5	.24	.92	9.8
1N 41E 27DBDC	BS-2A	32.3	17.64	998.	2- 3-77	9.0	304.	306.	113.	14.9	.38	.61	10.2
1N 41E 27DBDC	BS-2A	32.3	19.17	998.	11-19-76	10.0	320.	302.	108.	13.4	.03	.54	9.8
1N 41E 27DBDC	BS-33	30.5	13.78	997.	3-28-78	12.0	370.	342.	138.	15.5	.03	1.06	11.8
1N 42E 17BDDC	S-02	15.8	10.23	983.	3-30-78	11.5	260.	276.	35.	6.2	.03	2.07	22.5
1N 42E 17ADDC	S-2	15.8	10.46	983.	7-20-77	12.0	266.	270.	36.	6.7	.05	1.96	19.8
1N 42E 17ADDC	S-2	15.8	10.52	983.	4- 7-77	12.0	277.	266.	36.	6.8	.03	1.27	18.7
1N 42E 17ADDC	S-2	15.8	10.56	983.	11-18-76	11.0	280.	278.	37.	7.1	.03	1.82	16.9
1N 42E 17ADDC	S-2	15.8	10.58	983.	8-17-76	12.0	290.	278.	37.	7.2	.02	.02	17.5
1N 42E 17BDDC	S- 2	15.8	10.61	983.	6- 3-76	12.0	262.	239.	33.	6.6	.03	1.47	16.3
1N 42E 17BDDC	S- 2	15.8	10.66	983.	4- 6-76	15.0	216.	250.	35.	6.5	.03	1.57	18.1
1N 42E 17BDDC	S- 2	15.8	10.63	983.	3-17-76	12.0	289.	296.	37.	6.6	.06	.59	17.5
1N 42E 17BDDC	S- 2	15.8	10.67	983.	1-12-76	10.0	296.	274.	37.	6.5	.02	.84	17.8
1N 42E 17BDDC	S- 2	15.8	10.70	983.	9-30-75		299.	269.	37.	7.0	.15	1.00	16.2
1N 42E 17BDDC	S- 2	15.8	11.08	983.	4-10-75	10.0	193.	229.	32.	6.2	.01	.03	17.3
1N 42E 17BDDC	S- 2	15.8	11.05	983.	2- 4-75	10.0	216.	212.	33.	6.1	< .01	.15	15.6
1N 42E 17BDDC	S- 2	15.8	11.15	983.	6- 6-74		221.	218.	32.	6.2	< .01	.16	19.3
1N 42E 17BDDC	S- 2	15.8	11.07	983.	2- 4-74		176.	232.	34.	5.5	< .01	.07	17.2
1N 42E 17BDDC	S- 2	15.8	10.97	983.	9-25-73		208.	238.	34.	6.2	.18	.75	17.6

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORA-TORY)	CONTRIBUTING AQUIFER
2N 41E 34DDAD	697.	0.	3640.	3.2	.2	< .02	5291.	.2	4860.	7.32	ROSEBUD SPOILS
2N 41E 35ACDA	500.	0.	1650.	11.5	.1	.03	2654.	.5	2840.	7.19	ROSEBUD SPOILS
2N 41E 35CBAA	973.	0.	2212.	11.9	.1	.06	3701.	.7	3860.	7.04	ROSEBUD SPOILS
1N 37E 25ACBD	697.	0.	910.	11.5	.1	.03	1841.	3.3	2386.	7.38	SARPY SPOILS
1N 41E IBCAA 1	598.	0.	2569.	10.0	< .1	.27	3950.	.9	4077.	6.67	ROSEBUD SPOILS
1N 41E IDDAC 2	440.	0.	2034.	10.0	.1	8.25	3099.	.7	3399.	6.73	ROSEBUD SPOILS
1N 41E 3AABB	684.	0.	1324.	33.0	.3	.42	2354.	.5	2805.	7.04	ROSEBUD SPOILS
1N 41E 3AABA	834.	0.	2095.	55.0	.2	.55	3514.	.7	3865.	7.65	ROSEBUD SPOILS
1N 41E 3AABB	713.	0.	2100.	33.4	.1	.07	3387.	.7	3801.	7.06	ROSEBUD SPOILS
1N 41E 3AABB	697.	0.	1517.	22.1	.2	1.24	2597.	.6	3315.	7.88	ROSEBUD SPOILS
1N 41E 3AABB	916.	0.	1491.	27.8	.2	2.55	2780.	.6	3056.	7.28	ROSEBUD SPOILS
1N 41E 3AABA	817.	0.	1226.	16.8	.2	11.91	2324.	.7	2937.	7.94	ROSEBUD SPOILS
1N 41E 3AABB	625.	0.	3860.	49.5	.3	.09	5645.	1.1	5736.	7.35	ROSEBUD SPOILS
1N 41E 3AABB	629.	0.	1668.	13.6	.1	.99	2759.	.5	2994.	6.94	ROSEBUD SPOILS
1N 41E 22DAA	917.	0.	614.	16.0	.4	2.35	1229.	.9	1698.	7.25	RO-MCK SPOILS
1N 41E 22DAA	475.	0.	731.	8.5	.4	1.92	1354.	.8	1776.	7.65	BIG SKY SPOILS
1N 41E 27ARCC 3	723.	0.	4712.	73.0	.3	1.18	7052.	5.0	7025.	7.80	ROSEBUD SPOILS
1N 41E 27ARCC 3	673.	0.	4562.	66.0	.3	.36	6863.	5.2	7119.	7.09	BIG SKY SPOILS
1N 41E 27ARCC 3	519.	0.	4714.	71.0	.4	1.63	6912.	5.5	7069.	8.25	BIG SKY SPOILS
1N 41E 27ARCC 3	636.	0.	4883.	68.0	.2	.04	7221.	5.5	7491.	6.83	BIG SKY SPOILS
1N 41E 27ARCC 3	639.	0.	4787.	75.0	.2	.04	7171.	5.6	7480.	7.55	BIG SKY SPOILS
1N 41E 27ACCC	720.	0.	4135.	37.0	.3	.03	6140.	2.9	6128.	7.09	ROSEBUD SPOILS
1N 41E 27ADCA	1587.	0.	2869.	15.0	.2	.05	5013.	.9	5109.	6.72	RO-MCK SPOILS
1N 41E 27ADCC	774.	0.	2048.	14.0	.1	.03	3366.	1.4	3750.	6.96	RO-MCK SPOILS
1N 41E 27BADC 2	783.	0.	1725.	10.0	.2	.04	2957.	1.0	3344.	7.22	ROSEBUD SPOILS
1N 41E 27BADC 3	787.	0.	2624.	23.0	.2	5.42	4145.	1.6	4296.	7.03	ROSEBUD SPOILS
1N 41E 27BADC 3	741.	0.	2772.	57.0	.1	44.05	3801.	1.9	4341.	7.24	BIG SKY SPOILS
1N 41E 27BADC 3	727.	0.	2421.	28.4	.2	14.53	3878.	1.5	4394.	7.66	BIG SKY SPOILS
1N 41E 27DABB 2	827.	0.	1794.	32.0	.2	.03	3086.	1.1	3445.	7.03	RO-MCK SPOILS
1N 41E 27DACA	805.	0.	2029.	20.0	.2	1.42	3359.	1.3	3719.	6.84	ROSEBUD SPOILS
1N 41E 27DACA	859.	0.	1962.	27.3	.1	.02	3318.	1.0	3767.	7.75	BIG SKY SPOILS
1N 41E 27DADC	866.	0.	1937.	15.0	< .1	.04	3265.	1.2	3687.	7.05	ROSEBUD SPOILS
1N 41E 27DADC	875.	0.	1984.	17.0	< .1	.30	3354.	1.1	3718.	7.08	BIG SKY SPOILS
1N 41E 27DBAD	759.	0.	1761.	20.0	.1	.15	2960.	1.1	3369.	7.04	ROSEBUD SPOILS
1N 41E 27DBAD	771.	0.	1694.	15.0	.1	< .02	2887.	1.2	3394.	7.64	BIG SKY SPOILS
1N 41E 27DBDA	779.	0.	1625.	17.0	.2	3.03	3071.	1.1	3478.	6.90	RO-MCK SPOILS
1N 41E 27DBDC	698.	0.	1629.	13.0	.2	.10	2738.	1.1	3183.	6.91	ROSEBUD SPOILS
1N 41E 27DBDC	752.	0.	1640.	48.0	.1	.03	2846.	1.1	3246.	7.09	BIG SKY SPOILS
1N 41E 27DBDC	767.	0.	1680.	23.0	.5	< .02	2750.	1.1	3267.	7.75	BIG SKY SPOILS
1N 41E 27DBDC	758.	0.	1536.	46.0	.1	.03	2709.	1.0	3228.	7.42	BIG SKY SPOILS
1N 41E 27DBDC	791.	0.	1918.	15.0	.1	.03	3200.	1.2	3652.	6.93	ROSEBUD SPOILS
1N 42E 17BDDC	939.	0.	1037.	11.0	.2	.15	2112.	.4	2580.	7.11	ROSEBUD SPOILS
1N 42E 17BDDC	939.	0.	909.	41.0	.1	.07	2102.	.4	2545.	7.04	ROSEBUD SPOILS
1N 42E 17BDDC	989.	0.	1021.	52.0	.1	.40	2126.	.4	1597.	7.44	ROSEBUD SPOILS
1N 42E 17BDDC	869.	0.	1158.	9.0	.1	.03	2215.	.4	2700.	7.51	ROSEBUD SPOILS
1N 42E 17BDDC	849.	0.	1172.	10.0	.1	.70	2230.	.4	2706.	7.42	ROSEBUD SPOILS
1N 42E 17BDDC	825.	0.	995.	13.0	.1	.05	1973.	.4	2130.	7.21	ROSEBUD SPOILS
1N 42E 17BDDC	861.	0.	882.	8.6	.1	.00	1841.	.4	2526.	7.57	ROSEBUD SPOILS
1N 42E 17BDDC	815.	0.	1277.	7.8	.1	.31	2332.	.4	2603.	7.41	ROSEBUD SPOILS
1N 42E 17BDDC	819.	0.	1159.	7.9	.1	.07	2201.	.4	2635.	7.16	ROSEBUD SPOILS
1N 42E 17BDDC	806.	0.	1255.	6.8	.1	< .02	2287.	.4	2662.	7.58	ROSEBUD SPOILS
1N 42E 17BDDC	749.	0.	847.	9.2	< .1	.38	1703.	.4	2251.	7.53	ROSEBUD SPOILS
1N 42E 17BDDC	729.	0.	938.	7.5	< .1	.27	1687.	.4	2213.	7.55	ROSEBUD SPOILS
1N 42E 17BDDC	738.	0.	874.	10.0	< .1	.27	1743.	.4	2260.	7.63	ROSEBUD SPOILS
1N 42E 17BDDC	601.	0.	935.	7.4	< .1	.27	1703.	.4	2173.	7.79	ROSEBUD SPOILS
1N 42E 17BDDC	618.	0.	1060.	7.0	< .1	.34	1876.	.4	2300.	7.61	ROSEBUD SPOILS

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
1N 42E 18AAAB 1	5-01	14.6	12.59	987.	3-30-78	13.0	410.	312.	63.	7.5	.03	.46	17.3
1N 42E 18AAAB 1	5-1	14.6	13.94	988.	7-20-77	13.5	400.	308.	62.	8.4	.04	.71	15.6
1N 42E 18AAAB 1	5-1	14.6	12.73	988.	4- 7-77	13.0	380.	294.	61.	8.3	.04	.53	15.0
1N 42E 18AAAB 1	5-1	14.6	12.66	987.	11-18-76	12.5	376.	292.	61.	8.1	.09	.71	14.1
1N 42E 18AAAB 1	5- 1	14.6	12.68	988.	6- 3-76	14.0	360.	248.	56.	7.8	.03	.80	13.1
1N 42E 18AAAB 1	5- 1	14.6	12.64	988.	4- 4-76	12.5	347.	268.	62.	7.6	.10	.92	15.0
1N 42E 18AAAB 1	5- 1	14.6	12.64	988.	3-17-76	13.0	328.	270.	59.	7.8	.01	.78	14.7
1N 42E 18AAAB 1	5- 1	14.6	12.63	988.	1-12-76	11.5	352.	282.	57.	7.7	.02	.67	15.1
1N 42E 18AAAB 1	5- 1	14.6	12.44	988.	9-30-75		400.	324.	59.	8.4	.43	1.18	15.2
1N 42E 18AAAB 1	5- 1	14.6	12.38	988.	4-10-75	11.5	360.	289.	52.	8.6	.02	.02	14.7
1N 42E 18AAAB 1	5- 1	14.6	12.77	988.	2- 4-75	11.0	283.	288.	58.	8.1	.01	.01	12.2
1N 42E 18AAAB 1	5- 1	14.6	12.80	988.	6- 6-74		366.	283.	57.	8.1	.02	.40	16.1
1N 42E 18AAAB 1	5- 1	14.6	12.80	988.	5-23-74	14.0	373.	319.	59.	7.9	.01	.04	16.2
1N 42E 18AAAB 1	5- 1	14.6	12.78	988.	2- 4-74		250.	281.	57.	7.8	.04	.03	16.2
1N 42E 18AAAB 1	5- 1	14.6	12.72	988.	9-25-73		317.	269.	60.	8.8	3.00	1.05	17.0
1N 42E 18DAAB 2	EPA-12	10.1	5.50	978.	3-30-78	11.0	160.	123.	40.	4.9	.01	.01	23.1
1N 42E 18DAAC 2	EPA-10	9.4	5.28	978.	3-30-78	10.0	380.	190.	31.	6.6	.02	.20	15.2
1N 42E 18DAAD 3	EPA-3	8.5	3.72	976.	2- 3-77	10.0	130.	142.	20.	8.9	.02	< .01	13.0
1N 42E 18DAAD 3	EPA-3	8.5	4.25	976.	4-14-76	9.3	108.	162.	23.	8.7	.03	.35	10.9
9S 40E 9DCAB 2	DS-5A	42.7	26.11	1068.	4- 4-78	13.2	8.	4.	468.	5.3	.21	.08	11.0
9S 40E 9DCAB 2	DS-5A	42.7	26.00	1068.	7-22-77	14.0	7.	4.	414.	6.0	.32	.04	16.3
9S 40E 9DCAB 2	DS-5A	42.7	25.60	1068.	4-15-77	13.5	6.	3.	446.	4.8	.43	.05	13.7
9S 40E 9DCAB 2	DS-5A	42.7	26.86	1068.	7-15-76	14.0	6.	4.	504.	6.6	.44	.01	13.9
9S 40E 9DCAB 3	DS-5C	28.3	26.23	1068.	4- 4-78	13.0	93.	36.	287.	11.5	1.90	1.45	10.2
9S 40E 9DCAB 3	DS-5C	28.3	26.63	1068.	4-12-77	13.5	38.	35.	800.	15.6	.14	.71	8.2
9S 40E 15CACD	DS-3	13.7	10.71	1047.	4- 4-78	11.0	498.	343.	1455.	54.0	.04	1.50	32.0
9S 40E 15CACD	DS-3	20.4	8.98	1047.	7-22-77	10.0	520.	326.	1450.	52.0	.05	1.11	28.9
9S 40E 15CACD	DS-3	20.4	10.99	1047.	4-12-77	10.0	378.	260.	1180.	58.0	.05	.39	30.4
9S 40E 15CACD	DS-3	19.2	17.77	1047.	7-15-76	15.8	168.	131.	1445.	32.0	.02	.39	10.6
9S 40E 15CADA	DS-4	20.4	12.78	1047.	4- 4-78	8.5	14.	11.	504.	6.5	.03	.54	14.3
9S 40E 15CADA	DS-4	20.4	13.60	1047.	7-22-77	8.5	18.	14.	613.	7.4	.24	.20	16.2
9S 40E 15CADA	DS-4	20.4	16.15	1047.	7-15-76	7.5	11.	15.	522.	8.2	.01	< .01	12.4
9S 40E 15CADA	DS-4	20.4	17.16	1047.	7-15-76	7.0	13.	18.	496.	8.0	.21	.09	10.0
9S 40E 15CDBC 1	DS-1A	28.8	24.20	1054.	3-24-76	15.4	72.	56.	1090.	17.4	.22	.01	9.4
9S 40E 15CDBC 1	DS-1A	28.8	24.43	1054.	4- 4-78	8.0	66.	70.	1135.	17.8	.03	.59	11.3
9S 40E 15CDBC 1	DS-1A	28.8	25.05	1054.	10- 2-75		66.	80.	1060.	18.5	.26	1.36	12.4
9S 40E 15CDBC 1	DS-1A	28.8	25.80	1054.	5- 2-75	10.0	67.	66.	995.	15.9	.05	.32	12.6
9S 40E 15CDBC 2	DS-1B	29.0	21.95	1054.	11-20-76	12.0	43.	34.	960.	15.3	.03	.16	7.9
9S 40E 15CDBC 2	DS-1B	29.0	23.74	1054.	6- 4-76	13.5	53.	42.	985.	16.4	.01	.18	8.3
9S 40E 15CDBC 2	DS-1B	29.0	23.83	1054.	4-13-76	14.5	76.	34.	1440.	14.2	.90	.17	18.2
9S 40E 15CDBC 2	DS-1B	29.0	24.54	1054.	12- 3-75	12.5	51.	39.	985.	16.2	.09	.19	8.3
9S 40E 15CDBC 2	DS-1B	29.0	24.64	1054.	10- 2-75		49.	35.	1075.	17.1	.41	.16	7.7
9S 40E 15CDBC 2	DS-1B	29.0	25.48	1054.	5- 2-75	13.0	202.	63.	1640.	16.1	.23	.76	20.3
9S 40E 15CDBC 3	DS-7A	25.6	16.06	1054.	4- 4-78	10.5	33.	21.	702.	11.4	< .01	.13	10.2
9S 40E 15CDBC 4	DS-7A	28.0	15.97	1054.	4- 4-78	10.5	54.	44.	905.	13.3	.02	.24	14.1
9S 40E 15DACC 2	DS-2A	22.6	5.84	1045.	4- 4-78	12.5	25.	22.	436.	10.0	.07	.09	11.3
9S 40E 15DACC 2	DS-2A	22.6	5.64	1045.	4-12-77	12.5	14.	9.	448.	7.6	.40	.08	19.9
9S 40E 15DACC 2	DS-2A	22.6	6.46	1045.	7-15-76	12.0	12.	8.	560.	10.4	.29	.02	14.5
9S 40E 15DACC 3	DS-2C	19.8	10.82	1045.	4- 4-78		101.	98.	596.	11.3	.02	1.27	16.8
9S 40E 15DACC 3	DS-2C	19.8	12.62	1045.	7-15-76	16.1	21.	21.	578.	9.0	.20	.06	12.3
9S 40E 16BABD 1	DS-6A	47.9	26.82	1071.	4- 4-78	13.0	5.	2.	436.	4.4	.04	.01	9.2
9S 40E 16BABD 1	DS-6A	47.9	29.67	1071.	4-15-77		6.	2.	436.	4.7	.29	.03	11.0
9S 40E 16BABD 1	DS-6A	47.9	33.17	1071.	7-15-76	14.0	4.	2.	444.	4.6	.54	.02	10.7
9S 40E 16BABD 2	DS-6B	39.6	29.73	1071.	4- 4-78	13.5	22.	11.	628.	7.8	.04	.15	7.7
9S 40E 16BABD 2	DS-6B	39.6	31.00	1071.	4-15-77		16.	9.	560.	7.4	.12	.11	9.1
9S 40E 16BABD 2	DS-6B	39.6	31.82	1071.	7-15-76	14.0	13.	7.	536.	6.7	.27	.14	8.0

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORA-TORY)	CONTRIBUTING AQUIFER
1N 42E 1AAAAB 1	795.	0.	1721.	18.0	.1	.06	2940.	.6	3232.	7.84	ROSEBUD SPOILS
1N 42E 1AAAAB 1	783.	0.	1631.	28.0	.2	.04	2839.	.6	3170.	6.86	ROSEBUD SPOILS
1N 42E 1AAAAB 1	750.	0.	1574.	65.0	.2	.31	2767.	.6	3167.	7.26	ROSEBUD SPOILS
1N 42E 1AAAAB 1	796.	0.	1529.	46.0	.1	.03	2718.	.6	3097.	7.38	ROSEBUD SPOILS
1N 42E 1AAAAB 1	829.	0.	1290.	8.1	.1	.03	2302.	.6	2549.	7.01	ROSEBUD SPOILS
1N 42E 1AAAAB 1	805.	0.	1410.	10.7	.1	.08	2517.	.6	2971.	7.49	ROSEBUD SPOILS
1N 42E 1AAAAB 1	808.	0.	1289.	10.4	.1	.10	2369.	.6	2922.	7.75	ROSEBUD SPOILS
1N 42E 1AAAAB 1	826.	0.	1355.	9.5	.1	.07	2485.	.5	2861.	7.15	ROSEBUD SPOILS
1N 42E 1AAAAB 1	849.	0.	1730.	12.3	.1	.23	2968.	.5	3215.	7.54	ROSEBUD SPOILS
1N 42E 1AAAAB 1	815.	0.	1621.	9.6	< .1	.47	2658.	.5	2980.	7.67	ROSEBUD SPOILS
1N 42E 1AAAAB 1	461.	0.	1544.	9.7	< .1	.11	2430.	.6	2670.	7.71	ROSEBUD SPOILS
1N 42E 1AAAAB 1	741.	0.	1532.	13.3	.1	.16	2641.	.5	3105.	7.46	ROSEBUD SPOILS
1N 42E 1AAAAB 1	778.	0.	1630.	10.9	.2	.09	2798.	.5	3120.	7.17	ROSEBUD SPOILS
1N 42E 1AAAAB 1	530.	0.	1404.	8.2	.1	.11	2285.	.6	2720.	7.67	ROSEBUD SPOILS
1N 42E 1ADAAB 2	724.	0.	1440.	9.2	.1	.29	2482.	.6	2920.	7.67	ROSEBUD SPOILS
1N 42E 1ADAAC 2	648.	0.	417.	11.0	.2	2.17	1096.	.6	1568.	7.42	ROSEBUD SPOILS
1N 42E 1ADAAD 2	449.	0.	1178.	3.4	.2	.19	2226.	.3	2052.	7.36	ROSEBUD SPOILS
1N 42E 1ADAAD 3	619.	0.	417.	1.2	.2	6.60	1043.	.3	1576.	7.80	ROSEBUD SPOILS
1N 42E 1ADAAD 3	637.	0.	580.	3.5	.2	1.77	1272.	.3	1768.	7.81	ROSEBUD SPOILS
9S 40E 9DCAB 2	1263.	0.	20.	6.0	4.2	.03	1148.	33.7	1791.	7.66	W.DECKER SPOILS
9S 40E 9DCAB 2	1043.	0.	56.	7.0	3.7	.03	1037.	31.2	1647.	8.11	W.DECKER SPOILS
9S 40E 9DCAB 2	1114.	5.	2.	60.5	4.8	< .02	1094.	37.3	1736.	8.37	W.DECKER SPOILS
9S 40E 9DCAB 2	1334.	0.	30.	7.8	4.6	.04	1233.	40.5	1928.	8.26	W.DECKER SPOILS
9S 40E 9DCAB 3	945.	0.	230.	5.0	.5	.04	1140.	6.4	1770.	6.96	W.DECKER SPOILS
9S 40E 15CACD	1603.	0.	711.	13.5	.6	21.24	2433.	22.5	3491.	7.94	W.DECKER SPOILS
9S 40E 15CACD	1488.	0.	4463.	41.0	.5	.06	7620.	12.3	8282.	6.92	W.DECKER SPOILS
9S 40E 15CACD	1425.	0.	4395.	65.0	.4	.81	7540.	12.3	8119.	6.93	W.DECKER SPOILS
9S 40E 15CACD	1218.	0.	3359.	61.0	.6	23.72	5950.	11.4	7145.	7.81	W.DECKER SPOILS
9S 40E 15CACD	1205.	0.	2976.	31.0	1.0	.34	5382.	20.3	6796.	7.52	W.DECKER SPOILS
9S 40E 15CADA	1176.	0.	391.	8.0	2.1	.04	1610.	28.4	2440.	7.70	W.DECKER SPOILS
9S 40E 15CADA	1197.	0.	446.	10.0	1.7	.08	1716.	26.3	2570.	7.73	W.DECKER SPOILS
9S 40E 15CADA	1333.	64.	102.	12.0	.5	.33	1402.	24.2	2129.	8.80	W.DECKER SPOILS
9S 40E 15CADA	1369.	0.	56.	18.2	1.6	1.20	1294.	21.2	2039.	7.98	W.DECKER SPOILS
9S 40E 15CDBC 1	2056.	0.	1025.	18.5	.6	.32	3300.	23.4	4574.	7.46	W.DECKER SPOILS
9S 40E 15CDBC 1	2273.	0.	948.	22.2	.6	2.92	3392.	23.2	4660.	7.59	W.DECKER SPOILS
9S 40E 15CDBC 1	1928.	0.	1172.	20.9	.6	4.95	3392.	20.9	4611.	7.98	W.DECKER SPOILS
9S 40E 15CDBC 1	1546.	0.	1248.	30.0	.6	.23	3196.	20.7	4390.	7.19	W.DECKER SPOILS
9S 40E 15CDBC 2	1941.	0.	710.	39.0	.7	.07	2764.	26.6	3968.	7.75	W.DECKER SPOILS
9S 40E 15CDBC 2	1962.	0.	857.	15.0	.6	.03	2941.	24.7	4239.	7.39	W.DECKER SPOILS
9S 40E 15CDBC 2	1082.	0.	2416.		.3	.05	4532.	34.6	6087.	7.05	W.DECKER SPOILS
9S 40E 15CDBC 2	1923.	0.	831.	15.6	.7	.52	2892.	25.4	4220.	7.29	W.DECKER SPOILS
9S 40E 15CDBC 2	1584.	178.	898.	15.8	.8	4.11	3060.	28.6	4205.	9.23	W.DECKER SPOILS
9S 40E 15CDBC 2	862.	0.	3464.	21.2	.3	.45	5862.	25.8	7201.	6.84	W.DECKER SPOILS
9S 40E 15CDBC 3	1342.	0.	571.	11.0	.7	.03	2020.	23.7	2993.	7.18	W.DECKER SPOILS
9S 40E 15CDBC 4	1761.	0.	825.	8.0	.5	.02	2730.	22.2	3906.	7.06	W.DECKER SPOILS
9S 40E 15DBCC 2	992.	0.	261.	13.0	2.4	< .02	1268.	15.3	1965.	8.12	W.DECKER SPOILS
9S 40E 15DBCC 2	1147.	19.	82.	16.0	2.9	.15	1182.	23.5	1841.	8.51	W.DECKER SPOILS
9S 40E 15DBCC 2	1384.	0.	111.	9.0	3.3	.46	1409.	30.8	2201.	8.25	W.DECKER SPOILS
9S 40E 15DBCC 3	815.	0.	1129.	32.0	1.6	.25	2380.	10.4	3250.	7.50	W.DECKER SPOILS
9S 40E 15DBCC 3	1253.	0.	345.	21.0	2.8	.03	1626.	21.4	2459.	8.04	W.DECKER SPOILS
9S 40E 16BABD 1	1196.	0.	3.	5.0	3.9	.03	1055.	43.9	1665.	8.07	W.DECKER SPOILS
9S 40E 16BABD 1	1071.	33.	2.	22.0	3.8	< .02	1047.	39.1	1725.	8.68	W.DECKER SPOILS
9S 40E 16BABD 1	1180.	0.	2.	6.2	3.7	1.36	1059.	44.8	1677.	8.10	W.DECKER SPOILS
9S 40E 16BABO 2	1548.	0.	196.	10.0	3.2	< .02	1647.	27.6	2514.	7.74	W.DECKER SPOILS
9S 40E 16BABO 2	1509.	0.	28.	5.0	3.4	1.99	1381.	28.2	2201.	7.70	W.DECKER SPOILS
9S 40E 16BABD 2	1371.	0.	84.	6.5	3.6	.44	1340.	29.5	2073.	7.65	W.DECKER SPOILS

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

APPENDIX E

Concentrations of Trace Elements in Spoils Waters

LOCATION	DATE OF SAMPLE COLLECTION	ALUMINUM (AL) MG/L	ANTIMONY (SB) MG/L	ARSENIC (AS) UG/L	BERYLLIUM (BE) UG/L	BORON (B) MG/L	CADMIUM (CD) MG/L	CHROMIUM (CR) MG/L	COPPER (CU) MG/L	IRON (FE) MG/L	LEAD (PB) MG/L
2N 41E 34DDAD	3-23-73			< 2.0		.17	< .01	.02	.02	.30	.19
2N 41E 35ACDB	3-23-73			< 2.0		.96	< .01	< .02	.03	.40	.13
2N 41E 35CBAA	3-23-73			< 2.0		.46	< .01	.02	.03	1.10	.19
1N 37E 25ACBD	2- 7-78	.05	.2				.01	< .01	.05	.03	.05
1N 41E 1BCAB 1	3-30-78									.00	.15*
1N 41E 10DAC 2	3-30-78									.02	.12*
1N 41E 3AABA	7-20-77									.39	< .01
1N 41E 3AABA	11-18-76									.02	.13
1N 41E 3AABA	6- 3-76	< .05	< .2		< 5.0	.50	.02	.02	.02	.37	.09
1N 41E 3AABA	4- 6-76	.23	< .2		< 5.0	.34	.01	.01	.13	1.20	.12
1N 41E 3AABB	1-12-76									5.10*	.11*
1N 41E 3AABA	10- 1-75	.10	.3	4.4	< 5.0	.34	< .01	< .01	.01	.46	.06
1N 41E 3AABA	5-23-74									.03	.16
1N 41E 3AABA	3-23-73			< 2.0		1.20	< .01	< .02	< .02	.15	.16
1N 41E 22DAA	3-28-78									.03	< .05*
1N 41E 22DAA	10-19-77									.04	< .05
1N 41E 27ABCC 3	3-28-78									.06	.17*
1N 41E 27ABCC 3	7-21-77	.12	.6	< 2.0	< 5.0		.03	.03	.02	.06	.01
1N 41E 27ABCC 3	2-19-77			< 2.0						.00	< .01
1N 41E 27ABCC 3	6- 4-76	< .05	.2		< 5.0	.90	.02	.06	.02	.02	.13
1N 41E 27ABCC 3	4- 5-76	< .05	< .2		< 5.0	.95	.01	.02	.02	.77	.20
1N 41E 27ACCC	3-28-78									.07	.10*
1N 41E 27ADCA	3-28-78									.10	.15*
1N 41E 27ADCC	3-28-78									.05	.10*
1N 41E 27BADC 2	3-28-78									.04	.08*
1N 41E 27BADC 3	3-28-78									.04	.13*
1N 41E 27BADC 3	7-21-77	.07	.5	< 2.0	< 5.0		.02	.02	.02	.05	< .01
1N 41E 27BADC 3	4- 5-76	< .05	< .2		< 5.0	.24	< .01	.01	.01	.05	.13
1N 41E 27DABB 2	3-28-78									.21	.10*
1N 41E 27DACA	3-28-78									.03	.11*
1N 41E 27DACA	4-13-76									.03	< .05
1N 41E 27DADC	3-28-78									.08	.10*
1N 41E 27DADC	7-21-77									.02	< .01
1N 41E 27DBAD	3-28-78									.03	.09*
1N 41E 27DBAD	2- 4-77	.05	.3	< 2.0	< 5.0		< .01	.02	.01	.32	< .01
1N 41E 27DBDA	3-28-78									.03	.10*
1N 41E 27DBDC	3-28-78									.03	.09*
1N 41E 27DBDC	7-21-77	.08	.4	< 2.0	< 5.0		.02	.02	.02	.24	< .01
1N 41E 27DBDC	2- 3-77	< .05	.3	< 2.0	< 5.0		.01	.02	.01	.38	< .01
1N 41E 27DBDC	11-19-76	< .05	< .2	< 2.0	< 5.0	.60	.02	< .01	.02	.03	.09
1N 41E 27DDAC	3-28-78									.03	.12*
1N 42E 17BDDC	3-30-78									.03	.06*
1N 42E 17BDDC	7-20-77	< .05	.4	< 2.0	< 5.0		.02	< .01	.02	.05	< .01
1N 42E 17BDDC	4- 7-77	.18	.2	< 2.0	< 5.0		.01	.01	.01	.03	.01
1N 42E 17BDDC	11-18-76	< .05	< .2	< 2.0	< 5.0	.45	.01	< .01	.02	.03	.07
1N 42E 17BDDC	8-17-76									.02	.07
1N 42E 17BDDC	6- 3-76	< .05	< .2		< 5.0	.50	.01	< .01	.01	.03	.07
1N 42E 17BDDC	4- 4-76	< .05	< .2	< 2.0	< 5.0	.49	< .01	< .01	.01	.03	.07
1N 42E 17BDDC	3-17-76									.06	< .05
1N 42E 17BDDC	1-12-76									.44*	.08*
1N 42E 17BDDC	9-30-75	.10	.2	< 2.0	< 5.0	.49	< .01	< .01	.01	.15	.07
1N 42E 17BDDC	6-10-75					.27				.01	.05
1N 42E 17BDDC	2- 4-75								< .01	.01	< .05
1N 42E 17BDDC	6- 6-74								< .01	.01	.08
1N 42E 17BDDC	2- 4-74								< .01	.01	.08
1N 42E 17BDDC	9-25-73			< 2.0		.82	.01	< .02	< .02	.18	.06

NOTE
INDICATED CONCENTRATIONS IN MILLIGRAMS PER LITER (MG/L) AND MICROGRAMS PER LITER (UG/L) ARE DISSOLVED EXCEPT THOSE DENOTED BY (*) WHICH ARE TOTAL RECOVERABLE

Analyses continued on following page

LOCATION	DATE OF SAMPLE COLLECTION	LITHIUM (LI) MG/L	MANGANESE (MN) MG/L	MERCURY (HG) UG/L	NICKEL (NI) MG/L	PHOSPHATE (PO4 AS P) MG/L	SELENIUM (SE) UG/L	SILVER (AG) MG/L	STRONTIUM (SR) MG/L	TIN (SN) MG/L	ZINC (ZN) MG/L
2N 41E 34DDAD	3-23-73		4.70	< .2	.14	.04	< 5.0				.19
2N 41E 35ACDA	3-23-73		.37	< .2	.06	.03	< 5.0				.84
2N 41E 35CDAA	3-23-73		5.00	< .2	.10	.03	< 5.0				.45
1N 3E 25ACAD	2- 7-74	.05	.21		.01	.01		< .01	12.7		10.00
1N 41E 1ACAB 1	3-30-76	.08*	.91			.14*					
1N 41E 1DDAC 2	3-30-76	.07*	.02			.07*					
1N 41E 3AABA	7-20-77	.06	1.33			.33*					
1N 41E 3AABB	11-18-76	.05	1.44								
1N 41E 3A4BA	5- 3-76	.04	.06	< .3	.02	.01	3.5	.01	5.6	.45	.02
1N 41E 3AABA	4- 6-76	.03	.06		.07			< .01	3.7	.33	.86
1N 41E 3AABB	1-12-76		1.08*			.01					
1N 41E 3A4BB	10- 1-75	.02	.64	< .3	.04	.14*	< 2.0	< .01	2.3	.35	.03
1N 41E 3AABB	5-23-74		.37								
1N 41E 3A4BB	1-23-73		2.20	< .2	.08	.05	< 5.0				.27
1N 41E 22DA6	3-28-78	.05*	.34								
1N 41E 22DAA	10-19-77	.03	.04			.75*					
1N 41E 27ABCC 3	3-28-78	.06*	2.48								
1N 41E 27ABCC 3	7-21-77	.07	2.56		.12	.01	< 2.0	.01	6.2	1.32	.09
1N 41E 27ABCC 3	2-19-77	.07	1.52	< .3			< 2.0		15.9	4.88	
1N 41E 27ABCC 3	5- 4-76	.08	1.95	.4	.06	.11		< .01	6.2	.84	.05
1N 41E 27ABCC 3	4- 5-76	.08	2.44		.11	.01		.01	6.5	.68	.04
1N 41E 27ACCC	3-28-78	.07*	5.65								
1N 41E 27ADC4	3-28-78	.05*	6.90								
1N 41E 27ADCF	3-28-78	.08*	.43								
1N 41E 27ADDC 2	3-28-78	.07*	.47								
1N 41E 27DADC 3	3-28-78	.08*	.66								
1N 41E 27DADC 3	7-21-77	.08	1.27		.10	.01	< 2.0	.01	4.2	1.01	.30
1N 41E 27DADC 3	4- 5-76	.09	1.57		.12	.07		.01	6.6	.46	.03
1N 41E 27DARR 2	3-28-78	.06*	1.18								
1N 41E 27DACA	3-28-78	.07*	1.71								
1N 41E 27DACA	4-13-76		1.56								
1N 41E 27DADC	3-28-78	.07*	.55								
1N 41E 27DADC	7-21-77	.07	.60			.02*					
1N 41E 27DRAD	3-28-78	.07*	.71								
1N 41E 27DRAD	2- 4-77	.09	.65	.4	.08	.00	< 2.0	.01	11.8	.81	.05
1N 41E 27DRD4	3-28-78	.12*	1.38								
1N 41E 27DRDC	3-28-78	.07*	1.03								
1N 41E 27DRDC	7-21-77	.08	.92		.15	.01	< 2.0	.01	10.5	.72	.38
1N 41E 27DRDC	2- 3-77	.08	.61	< .3	.13	< .00	< 2.0	.01	11.8	.88	.05
1N 41E 27DRDC	11-19-76	.07	.54	< .3	.12	< .00	< 2.0	.01	13.2	1.42	.32
1N 41E 27DRRC	3-28-78	.09*	1.06								
1N 42E 17RDDC	3-30-78	.02*	2.07			.08*					
1N 42E 17RDDC	7-20-77	.03	1.96		.08	.01	2.4	< .01	3.2	.63	.20
1N 42E 17RDDC	4- 7-77	.03	1.27		.05	.05	2.8	< .01	2.8	.74	.07
1N 42E 17RDDC	11-18-76	.03	1.82	.4	.07	.00	< 2.0	.01	3.5	1.00	.36
1N 42E 17BDDC	8-17-76	.03	.02								
1N 42E 17RDDC	4- 3-76	.03	1.47	.6	.05	.09	< 2.0	.01	3.5	.37	.08
1N 42E 17RDDC	4- 4-75	.03	1.57		.06	.02	< 2.0	< .01	3.1	.30	.04
1N 42E 17RDDC	3-17-76		.59								
1N 42E 17RDDC	1-12-76		.07*			.05					
1N 42E 17RDDC	9-30-75	.02	1.00	< .3	.04	.18*	< 2.0	< .01	3.2	.28	.11
1N 42E 17BDDC	4-10-75		.03								
1N 42E 17BDDC	2- 4-75		.15								
1N 42E 17BDDC	6- 6-74		.16								
1N 42E 17BDDC	2- 4-74		.07								
1N 42E 17BDDC	9-25-73		.75		< .05	< .02*	< 2.0				.02

NOTE
INDICATED CONCENTRATIONS IN MILLIGRAMS PER LITER (MG/L) AND MICROGRAMS PER LITER (UG/L) ARE DISSOLVED EXCEPT THOSE DENOTED BY (*) WHICH ARE TOTAL RECOVERABLE

Analyses continued from preceding page

LOCATION	DATE OF SAMPLE COLLECTION	ALUMINUM (AL) MG/L	ANTIMONY (SB) MG/L	ARSENIC (AS) UG/L	BERYLLIUM (BE) UG/L	BORON (B) MG/L	CADMIUM (CD) MG/L	CHROMIUM (CR) MG/L	COPPER (CU) MG/L	IRON (FE) MG/L	LEAD (PB) MG/L
1N 42E 1RAAAR 1	3-30-78									.03	.08*
1N 42E 1RAAAR 1	7-20-77									.04	.01
1N 42E 1RAAAR 1	4- 7-77	.05	.3	< 2.0	< 5.0		.01	.01	.02	.04	.01
1N 42E 1RAAAR 1	11-18-76	.10	< .2	< 2.0	< 5.0	.63	.01	< .01	.02	.09	.13
1N 42E 1RAAAR 1	6- 3-76	.05	< .2		< 5.0	.80	.02	.01	.01	.03	.10
1N 42E 1RAAAR 1	4- 4-76	< .05	< .2		< 5.0	.78	< .01	< .01	.01	.10	.11
1N 42E 1RAAAR 1	3-17-76									.01	< .05
1N 42E 1RAAAR 1	1-12-76									5.10*	.13*
1N 42E 1RAAAR 1	9-30-75	.08	.3	< 2.0	< 5.0	.83	< .01	< .01	.02	.43	.09
1N 42E 1RAAAR 1	4-10-75			< 2.0		.96	.01		.03	.02	.15
1N 42E 1RAAAR 1	2- 4-75									.01	.08
1N 42E 1RAAAR 1	6- 6-74									.02	.09
1N 42E 1RAAAR 1	5-23-74									.01	.09
1N 42E 1RAAAR 1	2- 4-74									.04	.08
1N 42E 1RAAAR 1	9-25-73			< 2.0		1.23	.01	< .02	.02	3.00	.06
1N 42E 1RDAAB 2	3-30-78									.01	< .05*
1N 42E 1RDAAC 2	3-30-78									.02	.05*
1N 42E 1RDAAD 3	2- 3-77									.02	< .01
1N 42E 1RDAAD 3	4-14-76	< .05	< .2		< 5.0	.31	< .01	< .01	< .01	.03	< .05
95 40E 9DCAR 2	4- 4-78									.21	< .05*
95 40E 9DCAR 2	7-22-77	.31	< .2	< 2.0	< 5.0		.01	< .01	.01	.32	< .01
95 40E 9DCAR 2	4-15-77	.56	< .2	< 2.0	< 5.0		< .01	< .01	< .01	.43	< .01
95 40E 9DCAR 2	7-15-76									.44	< .05
95 40E 9DCAR 3	4- 4-78									1.90	< .05*
95 40E 9DCAR 3	4-12-77	.05	< .2	< 2.0	< 5.0		< .01	.02	.01	.14	< .01
95 40E 15CACD	4- 4-78									.04	.09*
95 40E 15CACD	7-22-77	< .05	.7	16.0	< 5.0		.02	.03	.04	.05	< .01
95 40E 15CACD	4-12-77	< .05	.4	38.0	< 5.0		.02	.03	.03	.05	.20
95 40E 15CACD	7-15-76	< .05	.3		< 5.0	.20	< .01	< .01	< .01	.02	.08
95 40E 15CADA	4- 4-78									.03	< .05*
95 40E 15CADA	7-22-77	.22	.2	2.0	< 5.0		< .01	< .01	.01	.24	< .01
95 40E 15CADA	4-11-77	.08	< .2	< 2.0	< 5.0		< .01	< .01	< .01	.01	< .01
95 40E 15CADA	7-15-76	.47	< .2		< 5.0	< .10	< .01	< .01	.01	.21	< .05
95 40E 15CDAC 1	3-24-76	< .05	< .2	< 2.0	< 5.0	.13	< .01	< .01	< .01	.22	< .05
95 40E 15CDAC 1	1- 6-76									1.80*	.08*
95 40E 15CDAC 1	10- 2-75	.10	< .2	< 2.0	< 5.0	.13	< .01	< .01	.01	.26	< .05
95 40E 15CDAC 1	5- 2-75					< .05				.05	.06
95 40E 15CDAC 2	11-20-76	.05	< .2	< 2.0	< 5.0	.17	.01	< .01	.02	.03	< .05
95 40E 15CDAC 2	6- 4-76	< .05	< .2		< 5.0	.10	< .01	< .01	.03	.01	< .05
95 40E 15CDAC 2	4-13-76	.14	3.6	16.7	< 5.0	.31	< .01	< .01	< .01	.90	.08
95 40E 15CDAC 2	12- 3-75	.25	.2	< 2.0			< .01	< .01	.01	.09	< .05
95 40E 15CDAC 2	10- 2-75	.32	< .2	< 2.0	< 5.0	.16	< .01	< .01	.01	.41	< .05
95 40E 15CDAC 2	5- 2-75					.62				.23	.10
95 40E 15CDAC 3	4- 4-78									< .01	< .05*
95 40E 15CDAC 4	4- 4-78									.02	< .05*
95 40E 15DACC 2	4- 4-78									.07	< .05*
95 40E 15DACC 2	4-12-77	.37	< .2	< 2.0	< 5.0		< .01	< .01	< .01	.40	< .01
95 40E 15DACC 2	7-15-76									.29	< .05
95 40E 15DACC 3	4- 4-78									.02	< .05*
95 40E 15DACC 3	7-15-76	.38	< .2		< 5.0	.10	< .01	< .01	.02	.20	< .05
95 40E 16BABD 1	4- 4-78									.04	< .05*
95 40E 16BABD 1	4-15-77	.45	< .2	< 2.0	< 5.0		< .01	< .01	.01	.29	.02
95 40E 16BABD 1	7-15-76	.78	< .2		< 5.0	.10	< .01	< .01	.01	.54	< .05
95 40E 16BABD 2	4- 4-78									.04	< .05*
95 40E 16BABD 2	4-15-77									.12	
95 40E 16BABD 2	7-15-76	.77	< .2		< 5.0	.10	< .01	< .01	.03	.27	< .05

NOTE
INDICATED CONCENTRATIONS IN MILLIGRAMS PER LITER (MG/L) AND MICROGRAMS PER LITER (UG/L) ARE DISSOLVED EXCEPT THOSE DENOTED BY (*) WHICH ARE TOTAL RECOVERABLE

Analyses continued on following page

LOCATION	DATE OF SAMPLE COLLECTION	LITHIUM (LI) MG/L	MANGANESE (MN) MG/L	MERCURY (HG) UG/L	NICKEL (NI) MG/L	PHOSPHATE (PO4 AS P) MG/L	SELENIUM (SE) UG/L	SILVER (AG) MG/L	STRONTIUM (SR) MG/L	TIN (SN) MG/L	ZINC (ZN) MG/L
1N 42E 18AAAR 1	3-30-78	.05*	.46			.15*					
1N 42E 18AAAR 1	7-20-77	.05	.71			.01					
1N 42E 18AAAR 1	4- 7-77	.04	.53		.06	.02	< 2.0	.01	9.5	.69	.08
1N 42E 18AAAR 1	11-18-76	.04	.71	< .3	.04	.00	< 2.0	.01	9.1	.85	.14
1N 42E 18AAAR 1	6- 3-76	.04	.48	< .3	.04	.00	< 2.0	.01	9.0	.34	.06
1N 42E 18AAAH 1	4- 4-76	.05	.92		.07	.01		< .01	8.6	.33	.03
1N 42E 18AAAH 1	1-17-76		.78								
1N 42E 18AAAH 1	1-12-76		1.18*			< .00					
1N 42E 18AAAH 1	9-30-75	.05	1.18	< .3	.04	.02*	< 2.0	< .01	7.1	.31	.04
1N 42E 18AAAH 1	4-10-75		.02		.04						.21
1N 42E 18AAAH 1	2- 4-75		.01								
1N 42E 18AAAR 1	4- 6-74		.40								
1N 42E 18AAAR 1	5-23-74		.04								
1N 42E 18AAAR 1	2- 4-74		.03								
1N 42E 18AAAR 1	9-25-73		1.05		< .05	< .02*	< 2.0				.04
1N 42E 18DAAB 2	3-30-78	.03*	.01			.17*					
1N 42E 18DAAC 2	3-30-78	.04*	.20			.04*					
1N 42E 18DAAD 3	2- 3-77	.03	< .01	< .3							.18
1N 42E 18DAAD 3	4-14-76	.03	.35		.06	.01		< .01	3.2	.23	.02
9S 40E 9DCAR 2	4- 4-78	.13*	.08			.04*					
9S 40E 9DCAR 2	7-22-77	.13	.04		.02	.02	< 2.0	< .01	.5	.06	.04
9S 40E 9DCAR 2	4-15-77	.14	.05		< .01	.04	< 2.0	< .01	.4	.09	.02
9S 40E 9DCAR 2	7-15-76		.01								
9S 40E 9DCAR 3	4- 4-78	.07*	1.45			.56*					
9S 40E 9DCAR 3	4-12-77	.24	.71		.05	.05	< 2.0	< .01	2.9	.19	.05
9S 40E 15CADD	4- 4-78	.41*	1.50			.39*					
9S 40E 15CADD	7-22-77	.39	1.11		.09	.01	< 2.0	.01	15.0	.86	.13
9S 40E 15CADD	4-12-77	.31	.39		.08	.11	< 2.0	.01	13.5	.84	.09
9S 40E 15CADD	7-15-76	.54	.39		.07	.01		< .01	9.0	.25	.03
9S 40E 15CADA	4- 4-78	.16*	.54			.00*					
9S 40E 15CADA	7-22-77	.18	.20		.03	.01	< 2.0	< .01	1.0	.08	.06
9S 40E 15CADA	4-11-77	.07	< .01		.01	.03	< 2.0	< .01	.4	.12	.01
9S 40E 15CADA	7-15-76	.08	.09		.01	.01		< .01	.7	.15	.01
9S 40E 15CDBC 1	3-24-76	.38	.01	< .3	.06	.02*	< 2.0	< .01	4.4	.13	< .01
9S 40E 15CDBC 1	1- 6-76		.67*			< .00					
9S 40E 15CDBC 1	10- 2-75	.35	1.34	< .3	.06	.04*	2.0	< .01	3.2	.15	.05
9S 40E 15CDBC 1	5- 2-75		.32								
9S 40E 15CDBC 2	11-20-76	.34	.16	< .3	.05	.01	< 2.0	< .01	3.1	.48	.16
9S 40E 15CDBC 2	6- 4-76	.35	.18	< .3	.06	.04	2.3	< .01	3.7	.13	.04
9S 40E 15CDBC 2	4-13-76	.40	.17		.07	.01	< 2.0	< .01	.3	.18	.09
9S 40E 15CDBC 2	12- 3-75	.36	.19	< .3	.06	.03*	< 2.0	< .01	3.8		.08
9S 40E 15CDBC 2	10- 2-75	.35	.16	< .3	.05	< .01*	2.0	< .01	2.4	.09	.06
9S 40E 15CDBC 2	5- 2-75		.74								
9S 40E 15CDBC 3	4- 4-78	.22*	.13			.22*					
9S 40E 15CDBC 4	4- 4-78	.20*	.24			.22*					
9S 40E 15DACC 2	4- 4-78	.11*	.09			.03*					
9S 40E 15DACC 2	4-12-77	.11	.08		.02	.03	< 2.0	< .01	.6	.15	.03
9S 40E 15DACC 2	7-15-76		.02								
9S 40E 15DACC 3	4- 4-78	.12*	1.27			.23*					
9S 40E 15DACC 3	7-15-76	.14	.06		< .01	.00		< .01	1.1	.08	< .01
9S 40E 16BABD 1	4- 4-78	.13*	.01			.05*					
9S 40E 16BABD 1	4-15-77	.14	.03		.02	.01	< 2.0	< .01	.3	.09	.20
9S 40E 16BABD 1	7-15-76	.12	.02		.02	.01		< .01	.3	.05	.03
9S 40E 16BABD 2	4- 4-78	.19*	.15			.03*					
9S 40E 16BABD 2	4-15-77	.17	.11								
9S 40E 16BABD 2	7-15-76	.15	.14		.01	.01		< .01	.8	< .05	.01

NOTE
INDICATED CONCENTRATIONS IN MILLIGRAMS PER LITER (MG/L) AND MICROGRAMS PER LITER (UG/L) ARE DISSOLVED EXCEPT THOSE DENOTED BY (*) WHICH ARE TOTAL RECOVERABLE

Analyses continued from preceding page

APPENDIX F

Concentrations of Major Chemical Constituents in Waters from Research Wells Completed in Undisturbed Coal Beds

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	DEPTH TO WATER (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE (C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
2N 41E 35DAAD 1	S-12	13.7	8.25	993.	3-30-78	12.0	215.	131.	138.	8.0	.03	.51	17.4
2N 41E 35DAAD 1	S-12	13.7	8.29	993.	1-12-76	11.0	224.	132.	143.	8.8	.02	.36	15.4
2N 41E 35DAAD 1	S-12	13.7	8.56	993.	2- 4-76	9.0	134.	111.	140.	8.9	< .01	< .01	14.3
2N 41E 35DAAD 1	S-12	13.7	8.11	993.	6- 6-74		199.	115.	143.	8.4	< .01	.23	17.1
2N 41E 35DAAD 1	S-12	13.7	8.23	993.	2- 4-74		139.	104.	156.	8.9	.01	.01	15.3
2N 41E 35DAAD 1	S-12	13.7	8.29	993.	9-25-73		53.	51.	190.	8.1	.26	.07	14.1
2N 41E 35DAAD 2	S-13	7.3	6.14	992.	3-30-78	9.0	432.	260.	95.	11.3	.03	.95	16.9
2N 41E 35DAAD 2	S-13	7.3	6.13	992.	1-12-76	10.0	510.	366.	119.	9.6	.05	1.69	16.6
2N 41E 35DAAD 2	S-13	7.3	6.40	992.	2- 4-76	9.0	333.	299.	77.	7.7	.01	.01	11.3
2N 41E 35DAAD 2	S-13	7.3	6.45	992.	6- 6-74		464.	292.	114.	9.3	.01	1.78	14.2
2N 41E 35DAAD 2	S-13	7.3	6.31	992.	2- 4-74		421.	305.	119.	9.9	.02	.70	17.3
2N 41E 35DAAD 2	S-13	7.3	6.10	992.	9-25-73		467.	351.	114.	9.0	1.42	1.25	15.0
1N 37E 13CAAC 1	S-1	21.4	8.49	1010.	7-11-74		96.	47.	650.	8.5	< .01	.01	10.9
1N 38E 19CAAA 1	S-2	11.7	2.01	1057.	7-11-74		114.	124.	48.	2.7	< .01	< .01	10.6
1N 38E 19CAAA 2	S-3	34.1	19.40	1052.	10-29-74	14.0	3.	1.	127.	2.5	2.26	.01	20.7
1N 38E 20AAAD 1	S-4	43.3	36.96	1067.	7-11-74	12.0	9.	1.	248.	4.2	.13	< .01	13.5
1N 38E 20AAAD 2	S-5	20.4	4.19	1087.	7-11-74	13.0	19.	4.	294.	4.1	< .01	< .01	7.9
1N 38E 30DDAA 2	S-6	13.5	13.47	1082.	7-11-74		14.	8.	75.	13.4	< .01	< .01	14.0
1N 38E 31DDAA 3	S-8	44.4	39.93	1082.	7-11-74		21.	4.	455.	3.0	< .01	< .01	9.5
1N 38E 31DDAA 2	S-9	39.9	35.94	1083.	10-24-74	12.0	12.	8.	194.	3.7	< .01	< .01	6.9
1N 38E 31DDAA 3	S-8	41.4	36.58	1083.	10-25-74	15.0	41.	20.	326.	5.4	< .01	< .01	13.2
1N 38E 34ABAD 1	S-1	33.5	13.42	1041.	10-29-74	16.0	23.	66.	43.	4.4	< .01	.14	19.2
1N 38E 34ABAD 2	S-11	59.7	37.40	1041.	10-30-74	13.0	7.	2.	188.	2.4	.12	< .01	7.7
1N 40E 13CCDC 1	S-22	64.6	40.40	1061.	11-19-74	12.0	262.	208.	180.	6.6	.04	.01	15.8
1N 40E 13CCDC 3	S-24	45.4	42.05	1061.	11-19-74	12.0	248.	208.	81.	7.8	.02	.10	15.3
1N 40E 13CCDC 3	S-24	45.4	42.09	1061.	5-24-75	11.0	243.	202.	76.	7.4	.02	.14	15.6
1N 40E 15AABA 1	P-10	15.4	9.05	1064.	5-16-75	9.0	173.	160.	98.	8.3	.06	.11	19.7
1N 40E 15AABA 1	P-9	13.2	6.47	1060.	11-19-74	11.0	294.	294.	196.	11.3	.05	.24	13.8
1N 40E 15AABA 1	P-9	13.2	2.90	1060.	5-16-75	8.0	243.	265.	193.	11.0	.05	.17	13.7
1N 40E 15ABBA 1	P-8	14.3	8.45	1064.	11-19-74	9.0	160.	205.	152.	10.7	.08	.45	14.9
1N 40E 15ABBA 1	P-8	14.3	4.84	1063.	5-16-75	7.0	137.	182.	135.	11.2	.07	.21	14.9
1N 40E 15ABBA 1	P-7	14.3	5.91	1063.	6- 3-76	10.0	78.	132.	124.	11.0	3.06	.05	24.3
1N 40E 15ABBA 1	P-7	14.3	5.83	1063.	5-16-75	9.0	69.	77.	118.	11.4	2.38	.06	36.2
1N 41E 19CAA 2	S-11	14.0	11.84	993.	3-30-78	12.0	112.	71.	396.	9.4	.03	.05	13.2
1N 41E 19CAA 2	S-11	14.0	10.04	992.	6- 6-74		112.	65.	387.	10.4	< .01	< .01	13.5
1N 41E 19CAA 2	S-11	14.0	10.47	992.	9-25-73		73.	72.	420.	10.3	.34	.06	11.1
1N 41E 19DAC 1	S-4	14.6	7.91	990.	3-30-78	11.0	324.	316.	116.	21.5	.03	.27	19.3
1N 41E 19DAC 1	S-4	14.6	7.05	989.	6- 6-74		349.	309.	116.	22.4	< .01	.24	17.2
1N 41E 19DAC 1	S-4	14.6	7.01	989.	9-25-73		349.	246.	127.	25.1	.08	.08	22.9
1N 41E 28ABBA 1	P-6	17.7	6.19	998.	5-16-75	9.0	217.	190.	160.	7.7	.01	.12	20.6
1N 41E 28AACD 1	S-27	45.4	33.83	1018.	5-24-75	10.0	284.	193.	220.	13.1	.01	.17	19.1
1N 41E 28AACD 2	S-24	39.4	25.10	1018.	9-10-75		114.	261.	88.	5.7	.18	.17	17.4
1N 41E 28AACD 2	S-24	39.4	25.19	1018.	5-16-75	11.0	141.	288.	93.	6.1	.01	.16	17.0
1N 41E 29DDD 1	S-6	15.2	11.19	994.	5-19-78	11.7	87.	81.	40.	3.9	< .01	< .01	19.1
1N 41E 32ADDD 1	S-8	15.2	11.73	994.	7-20-77	12.5	70.	65.	24.	3.3	.02	.01	18.8
1N 41E 32ADDD 1	S-8	15.2	11.28	994.	6- 6-74		77.	58.	23.	3.4	< .01	.11	20.5
1N 41E 32ADDD 1	S-8	15.2	11.44	994.	9-25-73		109.	92.	59.	5.1	.06	.11	14.7
1N 41E 32ADDD 2	S-7	8.7	6.06	994.	7-20-77	13.5	528.	432.	119.	13.4	.11	2.47	24.5
1N 41E 1HAA 1	S-14	75.6	40.31	1039.	7-12-76		45.	41.	202.	6.0	< .01	< .01	10.0
1N 41E 1HAA 2	S-19	48.6	40.27	1039.	5-14-75	13.0	73.	64.	122.	5.3	< .01	< .01	14.1

Analyses continued on following page

NOTE:
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS (CALC.AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORATORY)	CONTRIBUTING AQUIFER
2N 41E 35DARD 1	610.	0.	862.	7.4	.1	.31	1680.	1.8	2171.	7.31	MCKAY COAL
2N 41E 35DARD 1	611.	0.	830.	7.0	.1	1.13	1664.	1.9	2144.	7.27	MCKAY COAL
2N 41E 35DARD 1	439.	0.	704.	5.3	< .1	1.11	1334.	2.2	1860.	7.83	MCKAY COAL
2N 41E 35DARD 1	620.	0.	745.	7.3	.1	2.08	1542.	2.0	2068.	7.76	MCKAY COAL
2N 41E 35DARD 1	542.	0.	652.	5.9	< .1	.07	1348.	2.4	1796.	7.84	MCKAY COAL
2N 41E 35DARD 1	553.	0.	294.	4.1	.1	.25	877.	4.5	1370.	7.87	MCKAY COAL
2N 41E 35DARD 2	366.	0.	2102.	15.0	.1	1.07	3144.	.9	3419.	6.68	ROSEBUD COAL
2N 41E 35DARD 2	566.	0.	2392.	15.2	.1	1.04	3704.	1.0	3731.	7.01	ROSEBUD COAL
2N 41E 35DARD 2	398.	0.	1415.	8.5	.2	1.22	2248.	.8	2541.	8.12	ROSEBUD COAL
2N 41E 35DARD 2	517.	0.	2098.	14.9	.1	3.28	3277.	1.1	3644.	7.08	ROSEBUD COAL
2N 41E 35DARD 2	533.	0.	2106.	14.3	< .1	2.25	3220.	1.1	3510.	7.49	ROSEBUD COAL
2N 41E 35DARD 2	483.	0.	2418.	15.9	< .1	3.58	3639.	1.0	3770.	7.87	ROSEBUD COAL
1N 37E 13CARB 1	307.	7.	1535.	9.4	.3	.48	2514.	13.6	3268.	8.51	PRAIRIE COAL
1N 38E 19CARA 1	448.	0.	529.	10.5	.3	1.76	1043.	1.0	1549.	8.04	ROSEBUD-MCKAY C.
1N 38E 19CARB 2	186.	0.	131.	3.3	.2	1.08	393.	16.9	600.	8.05	PRAIRIE COAL
1N 38E 29BABD 1	485.	34.	129.	72.0	.4	.38	731.	22.1	1214.	8.74	ROSEBUD-MCKAY C.
1N 38E 29BABD 2	399.	24.	384.	6.6	.5	.03	864.	16.3	1390.	8.50	PRAIRIE COAL
1N 38E 30DDBA 2	183.	0.	167.	4.0	.2	.01	354.	3.6	569.	8.05	ROSEBUD-MCKAY C.
1N 38E 30DDBA 3	319.	14.	744.	9.3	.2	1.08	1417.	24.2	2163.	8.53	PRAIRIE COAL
1N 38E 31DDRA 2	408.	0.	132.	2.9	.2	.25	570.	10.8	933.	8.42	ROSEBUD-MCKAY C.
1N 38E 31DDRA 3	364.	24.	556.	9.1	.2	.12	1177.	9.5	1754.	8.62	PRAIRIE COAL
1N 38E 36BADD 1	381.	0.	95.	3.3	< .1	.23	442.	1.0	730.	8.23	ROSEBUD-MCKAY C.
1N 38E 36BADD 2	378.	28.	464.	6.5	.6	.14	1084.	32.7	1660.	8.71	PRAIRIE COAL
1N 40E 13CCDC 1	571.	0.	1346.	15.0	< .1	.08	2319.	2.0	2930.	7.40	MCKAY COAL
1N 40E 13CCDC 3	608.	0.	1003.	65.0	< .1	.05	1927.	.9	2620.	7.52	ROSEBUD COAL
1N 40E 13CCDC 3	601.	0.	1037.	6.7	.1	.20	1893.	.9	2376.	7.17	ROSEBUD COAL
1N 40E 15ABAB 1	518.	0.	727.	20.4	.2	.23	1610.	1.4	1886.	7.37	ROSEBUD COAL
1N 40E 15ABDA 1	576.	0.	1519.	109.0	.3	.45	2649.	2.0	3249.	7.66	ROSEBUD COAL
1N 40E 15ADDA 1	707.	0.	1423.	24.9	.3	.11	2522.	2.0	3113.	7.44	ROSEBUD COAL
1N 40E 15BDBA 1	546.	0.	1054.	13.5	.2	3.66	1890.	1.9	2444.	7.85	ROSEBUD COAL
1N 40E 15ADBA 1	445.	0.	782.	24.2	.2	.36	1613.	1.8	2174.	7.48	ROSEBUD COAL
1N 40E 15ADBD 1	243.	0.	762.	23.4	.1	.03	1269.	2.0	1748.	6.32	ROSEBUD COAL
1N 40E 15ADBD 1	25.	0.	664.	17.5	< .1	.58	994.	2.4	1305.	5.42	ROSEBUD COAL
1N 41E 18CAB 2	677.	0.	853.	11.0	.2	.49	1805.	7.2	2458.	7.68	MCKAY COAL
1N 41E 18CAB 2	714.	0.	789.	9.1	.2	.49	1738.	7.2	2440.	7.48	MCKAY COAL
1N 41E 18CAB 2	507.	0.	870.	7.9	.2	.27	1750.	8.4	2350.	7.49	MCKAY COAL
1N 41E 1DAC 1	383.	0.	1970.	10.0	< .1	1.18	2980.	1.1	3267.	7.27	MCKAY COAL
1N 41E 1DDAC 1	402.	0.	1955.	11.5	.3	1.40	2980.	1.1	3407.	7.63	MCKAY COAL
1N 41E 1DDAC 1	154.	0.	2008.	10.5	.2	.16	2865.	1.3	3140.	7.05	MCKAY COAL
1N 41E 4AABA	504.	0.	1139.	10.4	.2	.23	2047.	1.9	2537.	7.46	MCKAY COAL
1N 41E 10AACD 1	415.	0.	1280.	9.9	< .1	.50	2412.	2.5	2930.	7.70	ROSEBUD COAL
1N 41E 10AACD 2	781.	0.	869.	9.3	.1	.07	1763.	1.0	2219.	7.70	ROSEBUD COAL
1N 41E 10AACD 2	923.	0.	919.	7.0	< .1	.25	1920.	1.0	2493.	7.55	ROSEBUD COAL
1N 41E 12ADDD 1	376.	0.	305.	6.0	.3	.13	726.	.7	1114.	7.58	MCKAY COAL
1N 41E 12ADDD 1	293.	0.	158.	64.0	.3	.36	568.	.5	870.	7.54	MCKAY COAL
1N 41E 12ADDD 1	364.	0.	168.	7.6	.3	.20	537.	.5	703.	8.11	MCKAY COAL
1N 41E 12ADDD 1	383.	0.	444.	6.6	.3	.16	919.	1.0	1300.	7.91	MCKAY COAL
1N 41E 12ADDD 2	1037.	0.	2334.	41.0	.3	.21	4004.	.9	4444.	7.44	ROSEBUD COAL
1N 41E 16BAB 1	440.	0.	344.	5.0	.2	.03	870.	5.2	1310.	8.25	MCKAY COAL
1N 41E 16BAB 2	562.	0.	269.	4.1	.1	.16	827.	2.5	1234.	7.73	ROSEBUD COAL

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	DEPTH TO WATER (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE (C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
1N 41E 1AAAP 2	S-19	48.8	30.18	1039.	7-12-76		47.	83.	114.	4.9	< .01	< .01	12.4
1N 41E 21DADC 1	85-1	47.5	20.99	1015.	10- 1-75		198.	166.	352.	10.4	.02	.67	11.6
1N 41E 21DADC 2	85-4	30.4	14.67	1015.	4- 5-76	14.0	150.	160.	62.	5.0	.54	.24	16.0
1N 41E 22ACDC 1	85-41	93.9	45.75	1030.	3-28-78	13.0	212.	159.	422.	17.8	.02	.02	13.9
1N 41E 22ACDC 2	85-42	44.5	32.55	1030.	3-28-78	12.0	144.	170.	70.	5.0	.01	.10	18.7
1N 41E 22ACDC 3	85-43	44.5		1030.	7-21-77	12.5	175.	183.	61.	7.3	.03	.85	14.3
1N 41E 27AACC 1	85-20	29.6	14.05	998.	3-28-78	11.5	250.	250.	220.	10.4	.05	.32	16.9
1N 41E 27AACC 1	85-20	29.6	14.83	998.	1-10-76		216.	237.	223.	14.9	.03	.18	14.1
1N 41E 27AACC 2	85-21	29.6	15.91	998.	3-28-78	11.0	260.	264.	280.	9.0	.03	.20	17.5
1N 41E 27AACC 2	85-21	29.6	16.37	998.	7-21-77	11.5	250.	242.	216.	9.5	.03	.22	14.6
1N 41E 27AACC 2	85-21	29.6	17.91	998.	6- 4-76	11.0	232.	225.	217.	9.2	.01	.20	13.9
1N 41E 27AACC 2	85-21	29.6	17.19	998.	4- 5-76	12.5	230.	228.	238.	9.4	1.53	.25	14.4
1N 41E 27AADC 1	85-19	37.2	27.71	1013.	3-28-78	12.0	400.	356.	232.	9.2	.03	.26	16.7
1N 41E 27AADC 5	85-25	44.8	31.09	1015.	3-28-78	12.0	290.	250.	360.	10.9	.03	.10	15.7
1N 41E 27AADC 5	85-25	44.8	32.44	1015.	6- 4-76	12.0	253.	164.	434.	11.5	.01	.16	10.4
1N 41E 27AABA 1	85-16	30.0	24.34	1015.	3-28-78	12.5	225.	211.	147.	6.9	.02	.12	14.8
1N 41E 27ABBA 1	85-10	34.0	24.66	1015.	6- 4-76	12.0	303.	267.	188.	9.8	.01	.19	12.6
1N 41E 27BBBA 2	85-17	40.8	31.33	1017.	3-28-78	12.0	400.	386.	251.	9.6	.03	.22	15.2
1N 41E 27CAAC	85-11	47.2	39.26	1042.	3-28-78	12.5	500.	472.	136.	8.6	.04	.33	17.6
1N 41E 27CAAC	85-30	47.2	39.33	1042.	7-21-77	11.0	510.	492.	143.	9.3	.04	.40	14.0
1N 41E 27DAAC 1	S-14	15.5	9.97	998.	3-28-78	12.0	280.	276.	122.	9.5	.02	.09	17.2
1N 41E 27DAAC 1	S-14	15.5	10.59	998.	7-21-77	11.0	274.	272.	123.	7.5	.03	.09	15.6
1N 41E 27DAAC 1	S-14	15.5	13.26	998.	6- 5-76	12.5	428.	452.	172.	9.8	1.22	.26	14.1
1N 41E 27DAAC 1	S-14	15.5	13.42	998.	1-13-76	9.0	434.	475.	176.	9.2	.03	.20	14.1
1N 41E 27DAAC 1	S-14	15.5	14.20	998.	2- 5-75	9.0	374.	456.	176.	9.3	.01	.04	12.6
1N 41E 27DAAC 1	S-14	15.5	14.33	998.	5-20-74	11.5	415.	421.	169.	9.1	.05	.33	15.5
1N 41E 27DAAC 1	S-14	15.5	14.33	998.	2- 4-74		364.	424.	173.	9.0	.02	.06	13.9
1N 41E 27DAAC 1	S-14	15.5	14.33	998.	9-25-73		354.	445.	167.	10.2	.04	.02	11.9
1N 41E 27DCCA	85-31	44.2	42.04	1021.	3-28-78	12.5	452.	480.	280.	9.4	.04	.50	17.8
1N 41E 27DDAC 2	85-32	30.5	16.31	995.	3-28-78	12.0	358.	362.	136.	15.0	.11	.55	15.6
1N 42E 17DADA	S-4	9.5	5.83	978.	3-30-78	10.0	445.	1515.	335.	7.5	.08	.03	11.8
1N 42E 17DADA	S-4	9.5	6.30	978.	7-20-77	10.5	405.	730.	173.	9.0	.05	.15	12.0
1N 42E 17DADA	S-4	9.5	5.99	978.	6- 7-77	11.5	356.	590.	174.	7.8	.03	.02	11.6
1N 42E 17DADA	S-4	9.5	5.93	978.	2-14-77	11.0	400.	775.	186.	8.6	.07	.02	11.0
1N 42E 17DADA	S-4	9.5	5.93	978.	2-19-77	11.0	340.	665.	170.	7.9	.05	.08	11.8
1N 42E 17DADA	S-4	9.5	5.76	975.	11-18-76	11.0	445.	800.	209.	9.2	.05	.11	9.7
1N 42E 17DADA	S-4	9.5	5.72	975.	10- 7-76	11.5	530.	945.	213.	7.0	< .01	.09	13.4
1N 42E 17DADA	S-4	9.5	5.65	975.	8-17-76	11.0	540.	1125.	234.	9.4	.07	.03	10.0
1N 42E 17DADA	S-4	9.5	5.60	975.	6-23-76	9.0	535.	1530.	332.	10.0	.05	.39	9.3
1N 42E 17DADA	S-4	9.5	5.74	975.	6- 3-76	9.0	525.	1585.	330.	9.2	.05	.05	9.0
1N 42E 17DADA	S-4	9.5	5.78	975.	4-14-76	10.1	440.	852.	200.	8.6	.07	.10	10.7
1N 42E 17DADA	S-4	49.5	5.75	975.	1-14-76	9.0	286.	532.	151.	7.9	.03	.02	13.9
1N 42E 17DADA	S-4	9.5	5.72	975.	9-30-75		360.	778.	203.	9.1	.07	.49	12.9
1N 42E 17DADA	S-4	8.5	6.26	975.	6- 6-74	24.0	148.	171.	106.	6.0	< .01	.28	21.0
1N 42E 17DADA	S-4	9.5	5.97	975.	9-25-73		142.	123.	44.	5.5	.02	.26	16.2
1N 42E 18AAAR 2	S-3	23.2	13.58	988.	3-30-78	12.0	150.	105.	118.	6.0	.02	.02	16.4
1N 42E 18AAAR 2	S-3	23.2	13.94	988.	7-20-77	13.5	150.	105.	125.	6.7	.03	.04	15.0
1N 42E 18AAAR 2	S-3	23.2	13.59	988.	6- 4-76	13.0	150.	101.	130.	6.7	.05	.12	14.6
1N 42E 18AAAR 2	S-3	23.2	13.59	988.	1-12-76	10.5	123.	81.	106.	5.6	.02	.01	14.6
1N 42E 18AAAR 2	S-3	23.2	13.92	988.	2- 4-75	10.0	117.	81.	103.	5.8	< .01	< .01	14.5

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS (CALC.AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORA-TORY)	CONTRIBUTING AQUIFER
1N 41E 16BAR 2	494.	0.	335.	6.4	<.1	.05	813.	2.3	1249.	9.00	ROSEBUD COAL
1N 41E 21DADC 1	505.	0.	1438.	10.8	<.1	.02	2496.	4.5	3855.	7.85	MCKAY COAL
1N 41E 21DADC 2	540.	0.	681.	5.4	<.2	.24	1370.	.8	1785.	7.67	ROSEBUD COAL
1N 41E 22ACDC 1	523.	0.	1620.	10.4	<.4	.48	2713.	5.3	3288.	7.49	MCKAY COAL
1N 41E 22ACDC 2	570.	0.	698.	5.0	<.2	.06	1391.	.9	1858.	7.17	ROSEBUD COAL
1N 41E 22ACDC 3	217.	0.	927.	146.0	<.4	2.47	1624.	.8	2011.	7.77	ROSEBUD COAL
1N 41E 27ABCC 1	712.	0.	1519.	15.0	<.2	.03	2641.	2.5	3079.	7.39	MCKAY COAL
1N 41E 27ABCC 1	548.	0.	1517.	11.4	<.2	.02	2519.	2.5	2906.	7.79	MCKAY COAL
1N 41E 27ABCC 2	738.	0.	1496.	11.0	<.2	.29	2601.	2.1	3057.	7.15	MCKAY COAL
1N 41E 27ARCC 2	738.	0.	1405.	14.0	<.2	.49	2520.	2.3	3007.	7.24	MCKAY COAL
1N 41E 27ARCC 2	698.	0.	1377.	14.	<.1	.04	2419.	2.4	3042.	7.06	MCKAY COAL
1N 41E 27ARCC 2	706.	0.	1404.	10.7	<.2	.02	2495.	2.6	3043.	7.75	MCKAY COAL
1N 41E 27BADC 1	1043.	0.	2014.	11.0	<.1	.38	3557.	2.0	4089.	7.85	ROSEBUD COAL
1N 41E 27BADC 5	692.	0.	1930.	12.5	<.1	1.67	3260.	3.8	3670.	7.48	MCKAY COAL
1N 41E 27BADC 5	748.	0.	1674.	24.1	<.1	< .02	2920.	5.2	3904.	7.35	MCKAY COAL
1N 41E 27BDBA 1	710.	0.	1119.	7.4	<.1	.42	2091.	1.7	2566.	7.10	ROSEBUD COAL
1N 41E 27BDBA 1	617.	0.	1571.	7.7	<.1	< .02	2701.	1.9	3334.	7.24	ROSEBUD COAL
1N 41E 27BDBA 2	543.	0.	2544.	15.0	<.1	.44	3841.	2.1	4178.	7.67	ROSEBUD COAL
1N 41E 27CAAC	477.	0.	2627.	25.0	< .1	.04	4217.	1.0	4480.	7.09	ROSEBUD COAL
1N 41E 27CAAC	495.	0.	2634.	24.0	<.1	.04	4299.	1.1	4499.	7.20	ROSEBUD COAL
1N 41E 27DAAC 1	704.	0.	1484.	22.0	<.2	.24	2941.	1.2	3001.	7.17	MCKAY COAL
1N 41E 27DAAC 1	743.	0.	1430.	24.0	<.2	.03	2673.	1.3	2912.	7.24	MCKAY COAL
1N 41E 27DAAC 1	710.	0.	2524.	24.3	<.1	.03	3993.	1.4	4303.	7.59	MCKAY COAL
1N 41E 27DAAC 1	765.	0.	2544.	22.8	<.1	.32	4040.	1.4	4280.	7.33	MCKAY COAL
1N 41E 27DAAC 1	705.	0.	2550.	23.1	<.2	.09	3884.	1.4	4254.	7.46	MCKAY COAL
1N 41E 27DAAC 1	704.	0.	2574.	24.4	<.4	.29	3782E	1.4	4135.	7.60	MCKAY COAL
1N 41E 27DAAC 1	730.	0.	2454.	24.2	<.2	.29	3704.	1.5	3968.	7.46	MCKAY COAL
1N 41E 27DAAC 1	541.	0.	2466.	24.0	<.2	.23	3959.	1.4	4210.	7.74	MCKAY COAL
1N 41E 27DCCA	409.	0.	2917.	30.0	<.2	.09	4418.	2.2	4892.	6.99	ROSEBUD COAL
1N 41E 27DDAC 2	719.	0.	1945.	24.0	< .1	.10	3196.	1.2	3630.	6.96	MCKAY COAL
1N 42E 17DBDA	431.	0.	1724.	97.0	<.2	5.42	4843.	1.7	4621.	7.38	MCKAY COAL
1N 42E 17DBDA	428.	0.	1674.	104.0	<.1	.08	5355.	1.2	5124.	7.14	MCKAY COAL
1N 42E 17DBDA	449.	0.	3140.	96.0	<.1	.21	4545.	1.3	4276.	7.20	MCKAY COAL
1N 42E 17DBDA	464.	0.	4002.	92.0	<.2	.02	5694.	1.2	5572.	7.57	MCKAY COAL
1N 42E 17DBDA	462.	0.	3605.	96.0	<.1	.08	4832.	1.2	4920.	8.22	MCKAY COAL
1N 42E 17DBDA	438.	0.	4139.	92.0	<.1	.06	5969.	1.4	5972.	7.54	MCKAY COAL
1N 42E 17DBDA	462.	0.	4702.	164.0	< .1	.16	8475.	1.3	6955.	7.20	MCKAY COAL
1N 42E 17DBDA	417.	0.	5604.	85.0	<.1	.41	7910.	1.3	7319.	7.57	MCKAY COAL
1N 42E 17DBDA	451.	0.	7501.	4.7	<.1	2.15	10205.	1.7	9126.	7.94	MCKAY COAL
1N 42E 17DBDA	463.	0.	7409.	112.2	< .1	2.33	10401.	1.6	9257.	7.69	MCKAY COAL
1N 42E 17DBDA	425.	0.	4210.	71.0	<.1	2.43	6036.	1.3	6048.	7.53	MCKAY COAL
1N 42E 17DBDA	419.	0.	2571.	43.3	<.1	.45	3868.	1.2	4060.	7.44	MCKAY COAL
1N 42E 17DBDA	445.	0.	3958.	41.0	<.2	.54	5688.	1.4	5191.	8.20	MCKAY COAL
1N 42E 17DBDA	460.	0.	698.	10.7	<.2	.18	1335.	1.5	1572.	8.09	MCKAY COAL
1N 42E 17DBDA	383.	0.	836.	8.7	<.2	.02	1163.	.7	1520.	7.94	MCKAY COAL
1N 42E 18AAAB 2	211.	0.	866.	8.0	< .1	.39	1176.	1.8	1741.	7.68	MCKAY COAL
1N 42E 18AAAB 2	214.	0.	866.	8.5	<.1	.39	1177.	1.9	1741.	7.52	MCKAY COAL
1N 42E 18AAAB 2	214.	0.	846.	8.6	<.1	.79	1161.	2.0	1745.	7.72	MCKAY COAL
1N 42E 18AAAB 2	220.	0.	840.	9.1	<.1	.64	1088.	1.8	1651.	7.99	MCKAY COAL
1N 42E 18AAAB 2	210.	3.	829.	3.4	<.1	1.58	1052.	1.8	1685.	8.33	MCKAY COAL

NOTE
. INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	DEPTH TO WATER (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE (C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
1N 42E 14AAAA 2	S-3	23.2	14.05	98A.	6- 6-74		125.	82.	111.	5.9	.01	.01	16.7
1N 42E 14AAAA 2	S-3	23.2	14.05	98A.	2- 4-74		112.	87.	123.	5.4	.03	.06	15.2
1N 42E 14AAAA 2	S-3	23.2	13.96	98A.	9-25-73		136.	101.	137.	6.8	.44	.17	14.3
8S 39E 32DAAC	SW-21	62.8	17.43	1186.	3-23-76	14.0	2.	1.	310.	4.8	.06	.01	9.7
8S 40E 36DADA	SW-9	48.4	1.20	1063.	5- 1-75	11.0	5.	1.	416.	3.6	.09	< .01	9.1
8S 43E 20DDDD	MW-1	43.7	27.45	1076.	6-20-74		19.	12.	694.	7.1	< .01	.02	8.9
8S 43E 20DDDD	MW-1	43.7	27.45	1076.	6- 4-74		17.	15.	670.	6.7	< .01	.01	9.6
8S 44E 32DDAA	MW-2R	52.4	32.23	1140.	7- 6-77	15.0	10.	7.	695.	5.4	.11	.03	8.6
9S 39E 1AAAC	SW-23	98.1	25.23	1207.	3-19-76	14.2	6.	5.	266.	4.7	.06	.01	10.1
9S 39E 10CCAA 1	SW-1	84.4	29.65	1201.	3-17-76	15.0	5.	5.	426.	4.5	.12	.01	8.7
9S 39E 10CCAA 2	SW-2A	29.9	14.32	1201.	3-18-76	14.5	74.	139.	215.	4.0	.41	.04	11.0
9S 39E 22DAAC	3W1	53.3	14.04	1215.	4-25-73		18.	45.	154.	7.0	< .01	< .01	14.8
9S 39E 23CDAD	4W	57.4	24.43	1212.	4-10-73		12.	48.	521.	9.3	< .01	< .01	15.2
9S 39E 24AAAC	2W6	45.3	16.50	1201.	4-14-74	13.0	9.	3.	378.	4.2	< .01	< .01	12.6
9S 39E 26ACCA	3W6	73.4	36.38	1191.	4-24-73	12.0	6.	2.	445.	3.7	.10	< .01	13.1
9S 39E 25CADC	4W2	44.5	17.19	1194.	6-11-73		70.	113.	458.	9.7	< .01	< .01	14.3
9S 39E 26ABAB	1W5	41.4	14.87	1190.	4-24-73	14.0	4.	0.	376.	2.9	.02	< .01	12.4
9S 39E 27ACAC 2	W26	33.2	-1.48	1211.	6-12-74	11.0	4.	2.	366.	2.9	< .01	< .01	7.5
9S 39E 28CCAA 1	SW-16	54.5	10.06	1133.	11- 4-77	15.5	10.	4.	585.	5.0	.10	.01	12.1
9S 39E 28CCAA 2	SW-17	34.4	9.67	1133.	11- 4-77	12.5	4.	1.	422.	5.3	.44	.01	51.8
9S 39E 29AAAA	SW-20	41.4	23.20	1149.	3-10-76	15.0	8.	6.	1025.	4.3	.12	.01	10.4
9S 39E 29AADD 1	W-24	44.5	4.32	1151.	3- 9-76	10.5	5.	7.	638.	5.8	.18	.01	8.3
9S 39E 32ACBA	MW-13	44.2	14.47	1138.	10-14-77	11.5	174.	239.	87.	19.9	.06	.08	35.7
9S 39E 32CDAD	MW-40	49.4	13.84	1145.	11- 3-77	14.5	56.	42.	104.	12.7	.11	< .01	14.7
9S 39E 33DADD	MW-37	110.6	17.63	1119.	3-25-76	15.8	4.	1.	424.	9.9	.10	.01	11.3
9S 40E 1DDDA	3DW-10	24.1	4.69	1060.	4- 7-75	12.0	74.	57.	448.	12.9	< .01	.01	14.9
9S 40E 9AADD	3DW-15	43.9	22.36	1067.	4-30-75	11.0	5.	2.	415.	4.2	.59	.03	20.1
9S 40E 9BCAA 1	DS-2	50.6	22.50	1064.	4- 4-74	14.0	35.	27.	225.	7.8	.03	.06	10.1
9S 40E 9DCAA 1	DS-2	50.6	22.44	1064.	7-22-77	14.0	31.	23.	194.	7.1	.05	.02	9.0
9S 40E 9DCAA 2	DS-2	50.6	22.60	1064.	4-14-77	15.5	5.	2.	430.	4.5	< .01	< .01	8.8
9S 40E 11CACC 1	4DW-17	31.7	1.94	1043.	4-15-74	12.5	6.	2.	428.	4.0	.09	.01	8.3
9S 40E 12AAAA	4DW-5	42.4	14.02	1060.	3-25-75	14.0	131.	174.	406.	17.0	< .01	.01	14.3
9S 40E 17DDDC	4DW-9	47.1	24.39	1070.	2-20-75	11.0	7.	2.	552.	4.0	.05	.01	20.8
9S 40E 19DCC	4DW-10	55.4	29.39	1072.	2-25-75	11.0	14.	4.	776.	6.4	.01	.01	9.0
9S 40E 19DCCD	4DW-11	34.7	21.95	1070.	2-19-75	13.0	9.	3.	650.	5.2	< .01	.01	7.9
9S 40E 19DCCC 1	DS-24	47.7	-.03	1045.	6- 4-74	13.2	6.	3.	532.	5.4	.01	.01	8.2
9S 40E 19AADD 1	DS-3	41.1	24.34	1067.	4- 4-74	12.0	4.	2.	420.	3.9	.04	.02	10.3
9S 40E 19AADD 2	DS-3	41.1	24.82	1067.	4- 7-74	13.0	4.	2.	426.	3.7	.08	.01	9.1
9S 40E 19ABAD	4DW-15	72.2	57.50	1109.	5-14-74		5.	2.	415.	3.6	.10	< .01	11.0
9S 40E 21ACCA 1	DS-4	58.3	36.21	1077.	11-20-76	10.5	9.	3.	726.	6.2	.07	< .01	10.1
9S 40E 23ACCD 1	4DW-12	52.4	15.34	1056.	3-27-75	11.5	5.	4.	612.	5.8	.02	< .01	4.9
9S 40E 23BCCD 2	4DW-13	42.8	15.28	1055.	4- 4-75	12.7	7.	3.	688.	6.4	< .01	.01	8.0
9S 40E 23CBA	4DW-14	49.0	3.96	1056.	2-26-75	14.0	7.	2.	662.	6.7	.21	.01	10.6
9S 40E 24ABCA	4DW-16	139.6	18.30	1080.	2-24-75	13.0	12.	7.	730.	5.8	.01	.03	8.5
9S 40E 24AADD	4DW-17	74.2	18.71	1050.	2-27-75	11.0	8.	3.	710.	6.1	.25	< .01	9.0
9S 40E 29BAAC 1	DW-17	91.4	34.14	1088.	6- 4-74		6.	3.	458.	4.3	< .01	< .01	9.2
9S 41E 4CAAC 1	MW-27	22.9	13.99	1076.	11-20-76	11.0	12.	10.	766.	8.2	.30	.03	12.5
9S 41E 4CAAC 2	MW-28	46.6	16.29	1074.	7-22-77	11.0	7.	3.	1006.	8.7	.33	.03	15.6
9S 41E 4CAAC 3	MW-29	46.6	16.42	1074.	11-20-76	10.0	8.	3.	1020.	9.1	1.40	.06	15.7
9S 41E 4CCAD	MW-26	46.1	22.93	1074.	7-22-77	11.0	6.	3.	766.	7.8	.20	.02	12.7

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS (CALC.AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORA-TORY)	CONSTITUTING AQUIFER
1N 42E 18AAAB 2	229.	0.	685.	5.5	.3	1.46	1145.	1.9	1563.	7.92	MCKAY COAL
1N 42E 18AAAB 3	194.	0.	739.	3.8	.3	.02	1182.	2.1	1556.	8.16	MCKAY COAL
1N 42E 18AAAB 7	203.	0.	891.	4.5	.2	.20	1391.	2.2	1790.	7.97	MCKAY COAL
1S 39E 32DDAC	776.	0.	47.	1.9	.3	.39	750.	44.7	1193.	8.15	DIETZ 1 & 2 COAL
1S 40E 36ADDA	737.	0.	311.	4.2	5.3	.07	1120.	43.6	1736.	8.24	CANYON COAL
1S 43E 20DDDD	144A.	0.	266.	27.5	2.7	1.02	1021.	31.0	2691.	8.71	CANYON COAL
1S 43E 20DDDD	1461.	0.	269.	21.8	2.6	< .02	1780.	28.5	2772.	8.27	CANYON COAL
1S 44E 32DDAB	188A.	0.	0.	18.0	1.8	.07	1672.	41.7	2648.	7.76	ANDERSON COAL
1S 38E 1AADC	703.	0.	37.	7.7	.3	.57	685.	19.8	1082.	7.86	DIETZ 1 & 2 COAL
1S 38E 10CCAA 1	984.	0.	136.	6.1	2.3	.88	1076.	33.0	1677.	7.76	DIETZ 1 & 2 COAL
1S 38E 10CCAA 2	1016.	0.	332.	29.0	.7	.75	1310.	3.4	1893.	7.49	ANDERSON COAL
1S 38E 22DADC	351.	22.	230.	3.6	.4	1.49	669.	4.4	944.	8.51	DIETZ 1 & 2 COAL
1S 38E 23CDAD	623.	35.	756.	4.9	.5	1.48	1711.	15.1	2150.	8.80	DIETZ 1 & 2 COAL
1S 38E 24AAHC	1017.	4.	17.	4.2	3.4	.16	940.	28.2	1491.	8.38	DIETZ 1 & 2 COAL
1S 38E 25ACBA	771.	24.	246.	3.9	2.1	1.49	1175.	39.6	1680.	8.47	DIETZ 1 & 2 COAL
1S 38E 25CADC	654.	24.	987.	7.9	1.4	1.29	1898.	8.4	2440.	8.42	DIETZ 1 & 2 COAL
1S 38E 26AAAA	569.	58.	249.	5.1	1.2	1.08	995.	52.9	1370.	9.14	DIETZ 1 & 2 COAL
1S 38E 27ACAB 2	810.	72.	21.	4.4	3.1	.14	887.	37.9	1440.	9.34	CANYON COAL
1S 39E 2ACCAD 1	938.	0.	502.	15.0	1.4	< .02	1536.	40.0	2405.	7.94	DIETZ 1 & 2 COAL
1S 39E 2ACCAD 2	712.	0.	343.	6.0	2.1	.21	1184.	37.9	1721.	8.16	ANDERSON CL. BED
1S 39E 29AAAA	1758.	0.	830.	10.0	2.4	.62	2765.	44.8	3993.	8.27	ANDERSON COAL
1S 39E 29AADD 1	924.	0.	630.	11.6	1.7	.07	1761.	42.5	2653.	8.01	CANYON COAL
1S 39E 32ACAA	482.	0.	1094.	11.0	.7	8.25	1907.	1.0	2390.	7.67	DIETZ 1&2 CANYON CL.
1S 39E 32CDAD	389.	0.	289.	10.6	.3	< .02	639.	2.6	985.	7.55	DIETZ 1&2 CL. BED
1S 39E 33DDAD	466.	0.	168.	9.9	1.2	.46	1074.	46.1	1737.	7.97	ANDERSON 1 & 2
1S 40E 30ABA	698.	0.	787.	12.7	2.0	.07	1752.	9.5	2384.	7.88	DIETZ 2 COAL
1S 40E 9AADD	1132.	0.	3.	7.1	2.2	.11	1016.	38.1	1595.	8.02	DIETZ 2 COAL
1S 40E 9DCAH 1	511.	0.	249.	2.8	.7	1.65	810.	6.9	1265.	7.28	DIETZ 2 COAL
1S 40E 9DCAH 2	491.	0.	203.	21.5	.6	.91	702.	6.4	1094.	7.70	DIETZ 2 COAL
1S 40E 9DCAH 3	1198.	24.	0.	7.0	3.8	.05	1073.	42.8	1733.	8.66	DIETZ 2 COAL
1S 40E 11CACC 1	1143.	0.	7.	25.0	4.4	.05	1047.	39.0	1641.	8.10	DIETZ 2 COAL
1S 40E 12AHHA	707.	0.	2842.	43.1	.9	.14	4616.	10.9	6561.	8.15	DIETZ 2 COAL
1S 40E 13DCBC	1317.	39.	63.	23.6	3.0	.47	1467.	48.0	2185.	8.74	DIETZ 2 COAL
1S 40E 13DCCH	1969.	46.	2.	23.5	1.4	.02	1850.	47.6	2844.	8.77	DIETZ 1 COAL
1S 40E 13DDCD	1648.	0.	11.	20.7	1.6	3.49	1563.	47.5	2432.	8.87	ANDERSON COAL
1S 40E 15DADC 1	1456.	0.	5.	23.5	1.3	< .02	1269.	46.1	2208.	7.93	DIETZ 2 COAL
1S 40E 16AHCD 1	1137.	0.	0.	7.0	3.7	< .02	1009.	46.7	1610.	7.70	ANDERSON 1 C.
1S 40E 16ADCD 1	1139.	0.	1.	24.2	3.9	.33	1036.	46.8	1629.	8.12	ANDERSON 1 C.
1S 40E 18AABD	1123.	0.	6.	7.5	3.3	1.06	1006.	39.6	1640.	7.92	ANDERSON 1 COAL
1S 40E 21ACCA 1	1835.	0.	5.	71.0	1.6	2.39	1735.	54.9	2686.	8.27	ANDERSON 1 C.
1S 40E 23HCCD 1	1498.	78.	27.	18.7	2.2	.43	1479.	49.2	2274.	8.86	ANDERSON COAL
1S 40E 23HCCD 2	1684.	84.	2.	9.2	2.3	.39	1640.	55.6	2549.	8.79	DIETZ 1 COAL
1S 40E 23CHBA	1747.	0.	0.	19.9	1.7	.05	1650.	56.2	2606.	8.27	DIETZ 2 COAL
1S 40E 24AACB	1567.	0.	317.	21.9	1.4	.02	1875.	42.0	2878.	8.08	ANDERSON COAL
1S 40E 24AACD	1919.	0.	12.	14.1	1.7	.06	1708.	53.1	2690.	8.17	SMITH COAL
1S 40E 29HHAC 1	1105.	54.	4.	25.0	3.3	< .02	1113.	39.8	1816.	8.91	ANDERSON 2 COAL
1S 41E ACAHC 1	2016.	0.	17.	32.0	2.5	.04	1850.	30.5	2833.	7.92	ANDERSON COAL
1S 41E ACAHC 2	2028.	0.	528.	32.0	3.8	.03	2601.	40.1	3784.	8.02	DIETZ 1 COAL
1S 41E ACAHC 3	1933.	0.	412.	139.0	3.5	< .02	2592.	79.6	3670.	8.07	DIETZ 1 COAL
1S 41E ACBAD	2016.	0.	66.	4.0	3.8	< .02	1866.	67.9	2886.	8.15	DIETZ 2 COAL

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	OBSERVATION WELL DESIGNATION	WELL DEPTH (METERS)	DEPTH TO WATER (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE (C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)
9S 41E 4CRAD	ARF-29	6m.1	22.88	1074.	11-20-76	10.5	5.	2.	800.	7.7	.66	.02	14.1
9S 43E 3CRCD 1	MWC-2	90.2	26.13	1076.	8- 8-74	10.3	9.	8.	720.	5.5	< .01	< .01	7.3
9S 43E 3CRCD 1	MWC-2	90.2	24.99	1076.	6- 4-74		11.	1.	708.	5.2	.07	.01	8.4
9S 43E 3CRCD 2	MWC-1	12.0	9.28	1076.	10- 8-74	11.0	34.	48.	1108.	9.0	< .01	< .01	7.8
9S 43E 12AACC 1	MWC-16	18.M	1.11	1091.	6-21-77	12.0	264.	382.	875.	9.6	.07	.61	13.7
9S 43E 13HCAA	MWC-17	25.0	14.47	1100.	4-19-77	12.0	99.	117.	715.	10.0	.02	.02	10.7
9S 43E 17CAAA 2	MWC-7	20.1	8.53	1096.	4-29-77	13.5	165.	169.	1235.	12.9	.03	.25	10.3
9S 43E 19DDBA	MWC-27	40.5	39.62	1131.	7- 8-77	14.5	19.	12.	980.	6.4	.71	.03	8.6
9S 43E 22ACCA	MWC-15	39.3	8.90	1097.	6-23-77	13.0	5.	4.	556.	4.3	.08	< .01	9.2
9S 43E 27DAAB	MWC-16	114.3	18.29	1117.	9-13-77	12.2	6.	3.	560.	4.1	.05	< .01	9.9
9S 44E 7ADDC 1	MWC-4	41.0	30.77	1122.	4-28-77	11.5	9.	6.	668.	5.7	.10	.05	9.4
9S 44E 7ADDC 3	MWC-28	39.3	16.95	1122.	4-26-77	13.0	10.	7.	665.	5.1	< .01	.01	8.1
9S 44E 7HACD 1	MWC-29	24.7	14.13	1102.	9-27-77	13.5	498.	498.	1810.	22.2	.39	.06	14.8
9S 44E 8AAAA 2	MWC-24	33.5	16.47	1119.	4-28-77	12.5	177.	180.	876.	12.3	.03	.02	14.1
9S 44E 8ADDD	MWC-18	7m.1	6.03	1128.	4-28-77	12.5	6.	4.	576.	4.4	.08	.01	9.7
SAN BAW 23AAWC	40-39	95.1	15.95	1117.	11- 2-77	14.5	6.	3.	625.	4.9	.03	< .01	12.4
SAN BAW 23BACH 1	40-3A	87.2	16.15	1126.	10-21-77	14.8	6.	2.	616.	5.2	.13	.01	13.1
SAN BAW 23BACH 2	40-4A	50.9	12.MA	1126.	10-19-77	14.5	3.	2.	466.	3.8	.05	< .01	9.5

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	BICARBONATE (HCO3)	CARBONATE (CO3)	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS (CALC.AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORATORY)	CONTRIBUTING AQUIFER
9S 43E 8CBAD	1952.	0.	81.	54.0	3.6	.04	1928.	72.0	2837.	7.92	DIETZ 2 COAL
9S 43E 3CACD 1	1567.	96.	149.	26.7	2.5	< .02	1796.	42.5	2794.	8.06	CANYON COAL
9S 43E 3CACD 1	1598.	41.	118.	27.8	2.5	< .02	1753.	55.9	2594.	8.05	CANYON COAL
9S 43E 3CACD 2	1174.	0.	1946.	32.5	1.8	.68	3963.	33.9	5344.	8.06	DIETZ COAL
9S 43E 12AADC 1	907.	0.	3186.	33.0	.4	< .02	5210.	8.1	6835.	7.53	ANDERSON COAL
9S 43E 13ACAA	844.	3.	1636.	16.0	.6	< .02	2945.	11.5	2494.	7.47	ANDERSON COAL
9S 43E 13CAAA 2	1174.	0.	2447.	47.0	.8	< .02	4905.	16.1	5939.	7.58	ANDERSON COAL
9S 43E 14DDDA	1154.	0.	1970.	14.0	1.4	< .02	2603.	40.1	1734.	8.11	ANDERSON COAL
9S 43E 22ACCA	1052.	4.	0.	16.0	2.1	.03	1354.	46.2	2165.	8.49	ANDERSON COAL
9S 43E 27D1AB	1508.	0.	1.	17.0	.4	< .02	1343.	46.4	2118.	7.97	ANDERSON COAL
9S 44E 7ADDC 1	1748.	0.	45.	24.0	1.5	12.43	1619.	42.3	2615.	8.22	DIETZ COAL
9S 44E 7ADDC 3	1458.	7.	61.	26.0	1.3	.16	1719.	38.7	2757.	8.11	ANDERSON COAL
9S 44E 7A4CD 1	374.	0.	6090.	38.0	.4	.02	9442.	13.8	9936.	7.62	ANDERSON COAL
9S 44E 8DAAA 2	1402.	0.	1832.	34.5	.6	.18	3826.	11.1	4841.	7.59	ANDERSON COAL
9S 44E 9ADDD	1481.	0.	0.	24.0	1.7	.05	1406.	43.6	2221.	8.17	ANDERSON COAL
SAN 44W 2334DC	1388.	0.	204.	27.0	3.4	< .02	1569.	53.2	2388.	8.13	AND.DIETZ1&2 CL.
SAN 44W 2383CB 1	1332.	0.	209.	21.0	3.1	< .02	1538.	56.2	2335.	8.30	DIETZ1&2 CL. RED
SAN 44W 2388CB 2	1303.	0.	214.	10.5	3.9	< .02	1139.	49.2	1778.	8.03	ANDERSON CL. RED

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

APPENDIX G

Concentrations of Major Chemical Constituents in Ground Waters Used for Stock and Domestic Supplies

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
4N 37E 22BAAD	42.7	31.1	91*.	10- 6-76	10.5	4.	1.	482.	1.6	.11	.02	7.8	508.	0.
4N 39E 30DCAA	34.1	21.0	1085.	8-25-76	10.5	43.	26.	26.	3.6	< .01	< .01	14.6	320.	0.
4N 40E 31DCAA	61.0	15.4	987.	8-27-76	10.0	2.	0.	315.	1.1	.10	< .01	6.7	685.	18.
4N 42E 12CADA	26.5	5.5	805.	12-13-76		3.	1.	498.	1.6	.14	< .01	7.0	1869.	0.
4N 43E 30DAAC	91.4	9.1	814.	8-26-76	14.5	8.	9.	520.	2.7	< .01	< .01	6.8	1015.	0.
4N 44E 24BADA	18.6	8.4	902.	9-12-75	10.0	42.	31.	137.	4.0	< .01	< .01	8.3	472.	1.
4N 44E 24BBAA	53.3		899.	9-12-75	13.0	17.	9.	133.	3.4	< .01		9.3	355.	0.
4N 44E 29CCAC	32.6	20.8	924.	8-26-75	11.0	20.	7.	1048.	4.6	.05	< .01	8.3	741.	0.
4N 44E 32DDDA	36.6	19.5	911.	8-27-75	11.0	111.	99.	552.	7.0	.02	< .01	7.5	653.	0.
4N 44E 36AARA		19.4	936.	8-18-75	11.0	116.	75.	54.	4.7	< .01	< .01	12.6	528.	0.
4N 45E 11ADCB	54.9	21.6	841.	10- 6-76	10.3	19.	8.	1005.	3.8	< .06	< .02	6.5	1236.	0.
4N 48E 20DBBC	22.9	7.9	792.	8- 6-76	10.5	56.	40.	762.	7.6	< .51	< .59	21.6	880.	0.
4N 50E 31CCAA	33.5	12.2	829.	8- 5-76	9.5	68.	79.	1040.	8.9	< .12	< .05	11.8	668.	0.
3N 37E 8DA				6-25-73	10.5	32.	33.	517.	6.2	< .01	< .01	9.4	525.	5.
3N 37E 9DDDD				6-26-73	10.5	20.	40.	1485.	7.3	< .01	< .01	7.6	716.	72.
3N 37E 26DACD			968.	6-27-73	12.0	8.	20.	110.	2.6	< .01	< .01	10.9	237.	43.
3N 37E 35CDAC	30.5	24.4	983.	6-25-73	12.0	4.	2.	378.	1.7	< .01	< .01	7.9	534.	15.
3N 39E 36BAC	68.3	21.9	954.	7-26-73	13.5	4.	1.	378.	2.0	< .01	< .01	8.6	785.	19.
3N 41E 35CBAA	36.6	18.3	966.	3-23-76	9.5	153.	99.	45.	3.7	1.07	.16	12.9	516.	0.
3N 43E 34BCBB	43.0	19.8	869.	10- 4-73	2.6	5.	13.	528.	3.8	< .01	< .01	7.1	966.	71.
3N 44E 19AABA	48.5	17.9	920.	8-27-75	11.0	31.	12.	1295.	5.4	.02	.02	7.9	747.	0.
3N 44E 21CBAB	45.7	28.5	994.	8-21-75	11.0	107.	66.	39.	3.9	.02	.09	19.6	630.	0.
3N 44E 31CBDC 1			917.	8-19-75	11.0	84.	124.	169.	7.3	.01	.01	13.9	453.	0.
3N 44E 31CBDC 2	62.5	24.4	918.	10- 3-73	10.0	43.	101.	190.	7.8	< .01	< .03	13.3	409.	0.
3N 48E 27CADD	86.6	56.7	926.	7-14-76	12.0	2.	1.	432.	1.6	.13	.01	7.7	954.	29.
3N 51E 1DAAA	83.2	50.2	869.	8-11-76	12.0	3.	1.	508.	1.4	1.27	.01	7.0	558.	16.
3N 52E 32CA	79.2	52.4	911.	8-11-76	13.5	9.	3.	845.	2.6	.13	.03	7.8	821.	4.
2N 36E 23AADA			1010.	7- 9-73	11.0	Aa	11.	143.	2.4	< .01	< .01	8.8	299.	34.
2N 36E 28DDAC			992.	8-20-75	14.5	57.	27.	415.	5.9	.02	.01	9.6	576.	0.
2N 37E 8ADDC			942.	6-25-73	10.5	22.	46.	491.	6.3	< .01	< .01	9.6	471.	19.
2N 37E 20ABDC	27.4			6-26-73	11.0	6.	4.	704.	3.1	< .01	< .01	7.6	805.	34.
2N 37E 27DCBA	30.5	10.6	990.	10- 5-73	11.0	59.	44.	500.	5.6	< .01	< .01	12.4	358.	19.
2N 37E 31CCCB	18.3		1009.	7- 5-73	11.0	40.	105.	163.	4.9	< .01	< .01	14.0	437.	0.
2N 37E 32MMM	30.5		983.	7- 9-73	9.5	87.	304.	267.	10.5	< .01	.03	12.2	618.	0.
2N 37E 34CACC		6.5	981.	9- 6-73	10.0	120.	146.	1043.	13.9	< .01	.11	10.7	343.	15.
2N 37E 34DABD	21.3		981.	6-22-73	13.0	81.	121.	843.	11.5	< .01	< .01	10.3	264.	0.
2N 38E 15CCDC			1067.	7- 2-73	10.0	25.	126.	64.	4.2	< .01	< .01	15.7	405.	0.
2N 38E 18AABB	21.3		1009.	6-26-73	9.0	89.	131.	97.	5.3	< .01	< .01	11.8	417.	0.
2N 38E 20ADCA	48.8		1041.	7- 2-73	10.0	11.	57.	525.	6.5	< .01	< .01	1.7	365.	18.
2N 38E 32AADB	34.7	25.6	1074.	7-10-73	13.0	184.	248.	223.	8.4	< .01	.10	12.7	727.	0.
2N 38E 32AADB	34.7	25.6	1074.	7-10-73	14.0	125.	231.	232.	8.2	< .01	.03	13.8	542.	0.
2N 39E 5BCBA	17.4		978.	9-13-73	11.0	54.	108.	318.	5.9	< .01	.06	9.5	323.	0.
2N 39E 5DDDC	4.9	4.6	966.	9-13-73	13.5	249.	553.	905.	13.2	.01	.06	10.7	703.	0.
2N 39E 12CCC	169.2		963.	11-10-72	13.5	2.	1.	330.	1.8	.09	.01	23.5	739.	15.
2N 39E 20DBCB			1054.	8- 8-75	13.5	25.	15.	808.	4.6	.06	.02	5.3	338.	0.
2N 39E 23CAAB		30.0	1024.	7-26-73	27.0	51.	97.	108.	5.7	.01	.15	14.0	523.	0.
2N 39E 24CDAA	42.7	15.2	991.	7-25-73		144.	162.	450.	7.9	.02	< .01	9.6	508.	0.
2N 39E 25ACDC	41.5	17.7	1009.	7-12-73		277.	464.	552.	10.9	.04	.02	8.6	673.	0.
2N 39E 32DDDD			1073.	7-11-73	12.5	204.	306.	310.	10.6	.14	.02	19.0	514.	0.
2N 39E 34ADBB	18.3	8.2	1047.	7-10-73		157.	327.	179.	8.5	.02	.05	11.0	721.	0.

NOTE
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Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
4N 17E 22AAAD	10- 6-76	615.	8.0	1.5	.11	1370.	55.5	2107.	8.45	USGS	UNKNOWN
4N 19E 30CCAA	8-25-76	14.	.9	.2	.15	284.	.8	493.	7.84	USGS	BASAL TR SS
4N 20E 31DCAA	8-27-76	70.	19.5	5.5	.30	775.	56.5	1254.	8.63	USGS	LANCE FM.
4N 22E 12CADB	12-13-76	0.	153.0	6.2	< .02	1196.	64.6	1926.	8.23	USGS	LANCE FM.
4N 23E 30DBAC	8-26-76	113.	174.0	5.8	.03	1339.	29.5	2530.	8.08	USGS	UNKNOWN
4N 24E 24BADA	9-12-75	145.	4.0	.3	.57	604.	3.9	964.	8.14	USGS	UNKNOWN
4N 24E 24BBAB	9-12-75	60.	6.4	.4	.90	414.	6.5	673.	8.10	USGS	UNKNOWN
4N 24E 29CCAC	8-26-75	1651.	14.3	.0	10.49	3122.	50.2	4362.	6.86	USGS	UNKNOWN
4N 24E 32DDDA	8-27-75	1283.	10.7	.6	1.43	2394.	9.2	3149.	7.88	USGS	UNKNOWN
4N 24E 36AADA	8-18-75	282.	9.3	.2	.14	813.	1.0	1224.	6.38	USGS	UNKNOWN
4N 24E 11ADDA	10- 6-76	1148.	33.0	3.6	.21	2834.	49.1	4212.	7.85	USGS	UNKNOWN
4N 24E 28DBAC	8- 6-76	1284.	7.0	.1	< .02	2532.	18.9	3483.	7.87	USGS	UNKNOWN
4N 25E 31CCAA	8- 5-76	2691.	15.0	.4	.03	3643.	20.3	4782.	7.93	USGS	LEAD
4N 17E 8DA	6-25-73	836.	21.8	1.4	.27	1720.	15.3	2360.	8.36	MRMG	SUB-ROBINSON
3N 17E 9DDDD	6-26-73	2632.	11.8	.7	.02	4628.	44.3	5920.	8.65	MRMG	SUB-ROBINSON
3N 17E 26DACD	6-27-73	55.	6.2	.4	.81	373.	4.7	638.	9.04	MRMG	SUB-ROBINSON
3N 17E 35CDAC	6-25-73	344.	8.9	1.2	.20	1025.	39.2	1530.	8.63	MRMG	SUB-ROBINSON
3N 19E 36DAC	7-26-73	99.	42.0	4.0	< .02	944.	45.5	1390.	8.34	USGS	SUB-ROBINSON
3N 21E 35CBAA	7-26-73	436.	12.9	.2	.16	1019.	.7	1420.	7.58	USGS	BASAL TR SS
3N 21E 36ACDB	10- 4-73	293.	.3	.4	< .02	1550.	28.5	2070.	8.62	USGS	SUB-TERRET
3N 22E 18BABA	8-27-75	2194.	26.1	1.0	3.35	3943.	50.2	5334.	6.49	USGS	SUB-TERRET
3N 22E 21CBAB	8-21-75	117.	2.4	.4	.36	665.	.7	1075.	6.50	USGS	TERRET COAL
3N 22E 31CADC 1	8-19-75	463.	9.0	.4	7.46	1290.	2.6	1784.	6.38	USGS	SUB-TERRET
3N 22E 31CADC 2	10- 3-73	584.	7.3	.2	1.33	1148.	3.6	1550.	8.13	USGS	SUB-TERRET
3N 24E 27CADD	7-14-76	37.	40.0	4.5	.43	1024.	62.0	1694.	8.72	USGS	UNKNOWN
3N 25E 19AAAA	8-11-76	587.	15.0	.6	.34	1416.	72.2	2144.	8.62	USGS	TULLOCK
3N 25E 32CA	8-11-76	1141.	6.5	.6	.43	2423.	65.5	3540.	8.35	USGS	TULLOCK
2N 16E 21ADDA	7- 9-73	63.	2.6	.5	.05	420.	7.8	699.	8.80	MRMG	UNKNOWN
2N 16E 28DDAC	8-20-75	658.	14.1	.4	1.27	1472.	11.3	2113.	7.62	USGS	UNKNOWN
2N 17E 9ADDC	6-25-73	850.	22.1	1.5	.68	1699.	13.8	2530.	8.73	MRMG	SUB-ROBINSON
2N 17E 20ADDC	6-26-73	782.	13.8	1.3	.07	1952.	54.5	2640.	8.73	MRMG	SUB-ROBINSON
2N 17E 27DCBA	10- 5-73	1022.	10.6	.3	1.31	1850.	12.0	2710.	8.57	MRMG	SUB-ROBINSON
2N 17E 31CCFA	7- 5-73	525.	6.2	.2	.07	1073.	3.1	1544.	8.17	MRMG	SUB-ROBINSON
2N 17E 32BABA	7- 9-73	1448.	17.8	.2	.75	2451.	3.0	2970.	8.11	MRMG	SUB-ROBINSON
2N 17E 34CACC	9- 6-73	2780.	16.2	.2	3.93	4317.	15.1	5130.	8.44	MRMG	UNKNOWN
2N 17E 34DABD	6-27-73	2276.	13.9	.3	.70	3687.	13.9	4490.	8.12	MRMG	SUB-ROBINSON
2N 18E 15CCDC	7- 2-73	385.	4.7	.1	.70	824.	1.2	1232.	8.27	MRMG	SUB-ROBINSON
2N 18E 18AABA	6-26-73	557.	12.0	.2	4.81	1113.	1.5	1522.	8.17	MRMG	SUB-ROBINSON
2N 19E 28BDCA	7- 2-73	1062.	7.7	.1	.18	1869.	14.1	2600.	8.49	MRMG	SUB-ROBINSON
2N 19E 32AADA	7-10-73	1317.	8.2	< .1	.75	2359.	2.5	2890.	7.64	MRMG	ROSEBUD-MCKAY CL
2N 19E 32ABBA	7-10-73	1306.	8.8	< .1	.52	2192.	2.8	2710.	7.93	MRMG	ROSEBUD-MCKAY CL
2N 19E 5BCBA	9-13-73	980.	7.5	5.9	.27	1647.	5.7	2210.	8.29	USGS	SUB-MCKAY
2N 19E 5DDDC	9-13-73	4184.	27.0	< .1	< .02	6208.	7.3	6638.	7.95	USGS	SUB-MCKAY
2N 19E 12CCC	11-10-72	42.	29.6	4.2	.07	812.	47.1	1250.	8.55	USGS	TULLOCK SAND
2N 19E 20DBCB	8- 8-75	1539.	9.0	.7	1.22	2566.	31.5	3444.	7.29	USGS	SUB-MCKAY
2N 19E 23CAAA	7-26-73	330.	4.3	.2	.41	869.	2.1	1240.	7.98	USGS	SUB-MCKAY
2N 19E 24CDAA	7-25-73	1552.	9.6	.3	.05	2585.	6.1	3030.	8.10	USGS	SUB-MCKAY
2N 19E 25ACDC	7-12-73	3130.	22.3	.4	.07	4706.	4.7	5060.	7.83	USGS	SUB-MCKAY
2N 19E 32DDDD	7-11-73	1945.	10.5	.3	.77	3059.	3.2	3998.	8.03	USGS	UNKNOWN
2N 19E 34AADA	7-10-73	1482.	11.5	.2	.23	2531.	1.9	2940.	7.93	USGS	ROSEBUD COAL

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPER-ATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONAT (CO3)
2N 19E 34DADB	24.4	7.8	1058.	7-10-73	16.0	169.	180.	92.	5.3	.93	.13	14.0	484.	0.
2N 20E 6AABB	31.4	21.7	972.	7-23-75	10.5	170.	130.	208.	7.5	.02	.28	9.2	425.	0.
2N 20E 6CACA	31.7	25.6	966.	7-25-73	11.0	22.	14.	694.	3.4	.08	.83	8.6	507.	14.
2N 20E 11AABA	37.2	14.4	988.	8- 6-75	14.0	59.	37.	638.	7.8	.02	.05	4.9	423.	0.
2N 20E 28AADD	44.5	23.1	1029.	7-24-75	12.0	185.	172.	416.	8.8	.06	.06	10.7	740.	0.
2N 20E 29CDCC		23.6	1034.	7-24-75	16.0	14.	3.	608.	3.5	.01	.02	8.3	300.	0.
2N 20E 30BAA	75.0	21.9	997.	7-13-73	14.0	77.	108.	662.	5.8	4.30	.09	7.5	449.	0.
2N 20E 31DCCD	50.3	34.6	1076.	11- 9-72	13.0	162.	136.	78.	4.5	.51	.05	47.1	479.	0.
2N 20E 32BBAB			1033.	7-12-73		83.	66.	24.	2.4	.16	.02	11.0	483.	0.
2N 20E 35DDCD	76.2	44.6	1044.	7-13-73	11.5	256.	215.	170.	6.2	.03	.43	14.0	761.	0.
2N 21E 1DABA		18.6	960.	8-30-73	11.5	31.	92.	28.	3.7	< .01	.03	11.5	220.	19.
2N 21E 2DBBA	67.1		966.	11- 1-72		218.	109.	512.	8.7	3.00	.10	21.4	376.	0.
2N 21E 10BCBC	42.7	30.5	966.	7-19-73	13.0	169.	98.	55.	6.3	.50	.03	11.0	363.	0.
2N 21E 12CCAD	48.8	12.2	969.	3-23-76	9.5	116.	119.	57.	4.6	.03	.03	12.6	361.	0.
2N 21E 17ADAA	33.5		951.	10- 3-73	12.0	138.	200.	178.	9.2	< .01	.02	11.6	398.	0.
2N 21E 21CDDD	36.6	12.3	988.	8- 7-75	11.0	147.	122.	564.	9.9	.06	.07	9.6	546.	0.
2N 21E 24CAAA	8.2		1052.	6-11-75	10.0	129.	91.	24.	4.0	.02	.03	15.3	782.	0.
2N 21E 30DDAA			1024.	10- 2-73	13.0	316.	247.	150.	20.0	.03	.01		350.	0.
2N 22E 4DACA	31.1	18.3	917.	8-30-73	11.5	28.	35.	413.	6.7	1.51	< .01	11.3	273.	15.
2N 22E 9CABB		17.0	936.	8-30-73	11.0	117.	206.	107.	7.7	< .01	.02	10.8	220.	0.
2N 22E 6CADC	36.6	26.1	957.	11- 1-72	12.0	107.	161.	77.	5.2	1.45	.30	36.4	429.	0.
2N 23E 1BABD	118.9	73.2	917.	10- 3-73	12.0	5.	2.	516.	2.3	< .01	< .01	8.6	968.	30.
2N 23E 4CDAA			859.	9-27-73	12.5	3.	0.	450.	1.6	< .01	< .01	8.1	826.	53.
2N 23E 10DDAA	61.0	45.7	882.	10- 3-73	13.5	11.	10.	1125.	4.4	.02	.01	6.4	665.	33.
2N 23E 13CDAC			917.	10- 3-73	11.0	236.	345.	312.	17.2	.02	.02	18.3	501.	0.
2N 23E 16DABB		7.9	863.	10- 2-73	9.5	128.	107.	368.	9.5	< .01	.01	24.0	310.	0.
2N 23E 18AAAC	20.1	15.2	881.	6-12-75	11.0	91.	57.	890.	5.9	.04	.06	6.4	634.	0.
2N 23E 18CABB	14.9	12.8	890.	10- 2-73	9.5	54.	41.	290.	6.1	< .01	.02	9.6	336.	0.
2N 23E 24DDDD			911.	9-28-73	10.0	121.	182.	194.	10.5	< .01	.02	12.5	252.	0.
2N 23E 25ACAA	22.6	15.2	905.	9-28-73	11.0	98.	148.	190.	5.3	< .01	.02	10.7	285.	0.
2N 23E 27CCAC		22.3	887.	10-19-72	10.0	123.	390.	6.2	.15	.06	21.4	397.	0.	
2N 23E 28CCBC		5.8	863.	9-27-73	11.5	3.	1.	396.	1.6	< .01	< .01	7.5	695.	69.
2N 23E 30BDDA			887.	6-12-75	13.0	3.	1.	390.	1.8	< .01	< .01	7.5	839.	0.
2N 23E 36AAAB	12.8	8.2	914.	9-28-73	11.0	151.	171.	132.	5.7	< .01	.02	9.0	214.	0.
2N 24E 21DDDC		.9	898.	10-26-72	11.0	312.	33.	173.	4.2	1.20	.08	34.2	349.	0.
2N 24E 32DAC		9.5	903.	10-20-72	11.0	79.	47.	950.	4.7	.79	.06	21.4	669.	0.
2N 24E 33DDDB		4.2	881.	9-13-73	12.5	43.	16.	1140.	6.4	< .01	.04	7.5	567.	0.
2N 26E 23ABBC			914.	7-27-76	11.5	23.	21.	882.	4.6	.06	.02	7.3	597.	0.
2N 47E 22BBDD	70.1	13.8	890.	7-14-76	12.5	4.	2.	536.	1.8	.20	.01	8.2	897.	9.
2N 47E 23DABC	100.6	55.7	908.	7-14-76	25.0	5.	2.	626.	2.0	.01	< .01	8.2	1024.	11.
2N 47E 32BBBC	21.9	9.5	881.	7-13-76	11.0	138.	151.	685.	8.5	.04	.05	16.6	639.	0.
2N 48E 29ABA	25.9	10.7	922.	8-18-76	9.0	83.	35.	50.	4.6	.07	.02	11.0	355.	0.
2N 48E 29ABA	25.9	10.7	922.	7-14-76	10.0	87.	34.	45.	4.6	.04	.02	11.9	344.	0.
2N 48E 15BCBC	82.9	62.5	978.	7-15-76	12.5	4.	2.	586.	1.9	.08	.01	8.3	711.	19.
2N 48E 19BDDC	29.9	20.8	915.	7-15-76	13.0	2.	1.	351.	1.2	.43	.01	8.0	513.	22.
2N 48E 30DDAC	86.8	27.4	933.	7-14-76	12.0	2.	1.	500.	1.7	.02	< .01	8.1	1152.	0.
2N 49E 4CADC	23.8	20.8	878.	7-15-76	14.0	21.	10.	740.	5.5	.04	.01	12.4	816.	0.
2N 51E 4CCCD	30.8	3.7	955.	8-26-76	10.5	2.	3.	845.	2.8	.05	.04	8.2	823.	0.
2N 51E 20DDD	41.5	3.7	887.	8- 4-76	11.5	3.	1.	366.	1.2	.08	.01	8.5	624.	10.
2N 53E 1DACC	30.8	17.9	850.	8-17-76	10.5	68.	29.	43.	2.6	.38	.03	11.5	414.	0.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/LT EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORA-TORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
2N 39E 34DADR	7-10-73	950.	7.3	.1	.11	1657.	1.2	2050.	7.89	USGS	ROSEBUD COAL
2N 40E 6AAAB	7-23-75	1225.	17.6	.2	.34	2067.	4.2	2624.	6.43	USGS	SUB-MCKAY
2N 40E 6CBCB	7-25-73	1134.	12.2	.5	.09	2151.	28.9	2840.	8.39	USGS	SUB-MCKAY
2N 40E 11AAPA	8- 6-75	1288.	19.6	.5	4.52	2267.	16.1	3010.	6.84	USGS	SUB-MCKAY
2N 40E 28AADD	7-24-75	1410.	12.1	.3	.97	2580.	5.3	3231.	6.87	USGS	SUB-MCKAY
2N 40E 29CDCC	7-24-75	1185.	12.1	.8	1.36	1903.	38.6	2725.	6.83	USGS	SUB-MCKAY
2N 40E 30AAA	7-13-73	1656.	12.3	.5	.05	2754.	11.4	3360.	8.06	USGS	SUB-MCKAY
2N 40E 31DCCD	11- 9-72	703.	7.8	.1	< .02	1375.	1.1	1740.	7.63	USGS	ROSEBUD COAL
2N 40E 32BAAA	7-12-73	289.	3.1	.3	.07	657.	.4	991.	7.93	USGS	SUB-MCKAY
2N 40E 35DDCD	7-13-73	1216.	9.9	.3	.23	2273.	1.9	2670.	7.87	USGS	SUB-MCKAY
2N 41E 10ABA	A-30-73	274.	5.5	< .1	2.06	575.	.6	878.	8.66	USGS	SUB-MCKAY
2N 41E 20BBA	11- 1-72	1736.	9.9	.3	.02	2803.	7.1	3290.	8.02	USGS	SUB-MCKAY
2N 41E 10BCBC	7-16-73	620.	6.5	.2	1.58	1147.	.8	1790.	7.88	USGS	SUB-MCKAY
2N 41E 12CCAD	8-23-76	586.	7.8	.3	.62	1046.	.8	1444.	7.76	USGS	RASAL TR SS
2N 41E 17AAAA	10- 3-73	1160.	29.0	.2	.23	1921.	2.3	2398.	7.96	MRMG	SUB-MCKAY
2N 41E 21CDDD	A- 7-75	1582.	13.5	.8	2.26	2720.	8.3	3484.	6.92	USGS	SUB-MCKAY
2N 41E 24CAAA	6-11-75	177.	3.6	.3	.16	790.	.4	1371.	7.49	USGS	ROSEBUD DB
2N 41E 30DDAA	10- 2-73	1767.	21.8	.3	.86	2695.	1.5	3076.	7.66	MRMG	SUB-MCKAY
2N 42E 4DACA	A-30-73	832.	8.8	< .1	.07	1486.	12.2	2058.	8.45	USGS	SUB-MCKAY
2N 42E 5CABB	A-30-73	1136.	9.5	< .1	.07	1707.	1.4	2072.	8.29	USGS	SUB-MCKAY
2N 42E 6CBDC	11- 1-72	718.	6.0	< .1	.16	1323.	1.1	1680.	7.69	USGS	SUB-MCKAY
2N 43E 2AADD	10- 3-73	6.	205.0	2.1	1.69	1254.	53.1	2080.	8.63	USGS	SUB-TERRET
2N 43E 4CDAA	9-27-73	165.	37.5	3.8	.20	1129.	65.4	1726.	8.81	USGS	SUB-TERRET
2N 43E 10DDAA	10- 3-73	1653.	105.0	1.0	1.33	3278.	58.5	4340.	8.61	USGS	SUB-TERRET
2N 43E 12CDAC	10- 3-73	2236.	11.4	.1	.75	3423.	3.0	3660.	7.73	USGS	UNKNOWN
2N 43E 16DABB	10- 2-73	1237.	11.6	.1	1.78	2039.	5.8	2680.	8.05	USGS	SUB-TERRET
2N 43E 18AAAC	6-12-75	1765.	40.0	.9	3.91	3181.	18.0	4841.	7.83	USGS	UNKNOWN
2N 43E 20CABB	10- 2-73	623.	3.8	.1	1.11	1194.	7.2	1650.	7.87	USGS	AL. ROSEBUD TRIB
2N 43E 24DDDD	9-28-73	1212.	6.1	.1	.72	1863.	2.6	2340.	8.12	USGS	UNKNOWN
2N 43E 25BCAA	9-28-73	972.	10.6	< .1	< .02	1575.	2.8	2060.	7.71	USGS	SUB-TERRET
2N 43E 27CCBC	10-19-72	1247.	34.0	.4	2.94	2153.	5.9	2800.	7.78	USGS	SUB-TERRET
2N 43E 28CCAC	9-27-73	58.	90.0	4.6	.66	973.	55.1	1520.	8.80	USGS	UNKNOWN
2N 43E 30DDDA	6-12-75	1.	147.0	3.8	.32	976.	56.0	1843.	8.25	USGS	UNKNOWN
2N 43E 36BAAB	9-28-73	1114.	12.0	< .1	10.17	1710.	1.7	2150.	7.70	USGS	SUB-TERRET
2N 44E 21DDDC	10-26-72	957.	12.5	.6	.07	1699.	2.5	2030.	7.80	USGS	UNKNOWN
2N 44E 32DAC	10-20-72	1800.	23.3	.4	.09	3256.	20.9	4360.	7.82	USGS	SUB-TERRET
2N 44E 33DDDA	9-13-73	2092.	20.9	.3	1.78	3607.	37.7	4766.	8.26	USGS	UNKNOWN
2N 46E 23ABAC	7-27-76	1042.	21.6	.8	.95	2097.	24.8	3054.	8.10	USGS	UNKNOWN
2N 47E 22BDAD	7-14-76	373.	38.9	4.4	.22	1418.	57.1	2189.	8.36	USGS	LERD
2N 47E 23DABC	7-14-76	422.	62.0	4.5	< .02	1646.	59.9	2526.	8.46	USGS	LERD
2N 47E 32ABBC	7-13-76	1866.	13.9	.3	< .02	3194.	9.6	4052.	7.69	USGS	RASAL TR SS
2N 48E 28ABA	8-18-76	165.	4.0	.3	.86	530.	1.2	850.	7.72	USGS	TERRET DB
2N 48E 28APA	7-14-76	157.	2.0	.3	.25	511.	1.0	789.	7.61	USGS	TERRET DB
2N 48E 15BCBC	7-15-76	650.	6.6	1.0	.37	1628.	61.6	2447.	8.59	USGS	LERD
2N 48E 19BDDC	7-15-76	261.	15.5	1.9	.52	910.	57.9	1469.	8.83	USGS	SUB-TERRET
2N 48E 30DDPC	7-14-76	0.	90.0	5.8	< .02	1176.	70.8	1962.	8.25	USGS	LERD
2N 49E 4CADC	7-15-76	990.	12.2	1.7	.46	2195.	33.0	3088.	8.11	USGS	RASAL TONGUE R.
2N 51E 4CCCD	8-26-76	1119.	17.0	.3	.03	2401.	87.1	3515.	8.21	USGS	RASALTONGUE R.
2N 51E 20DDD	8- 4-76	262.	4.4	1.6	.17	965.	45.0	1533.	8.62	USGS	RASALTONGUE R.
2N 53E 1DACC	8-17-76	32.	6.6	.2	2.78	398.	1.1	688.	7.69	USGS	MELL CR.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE (C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
1N 36E 1RADD			1024.	7- 9-73	12.5	32.	165.	105.	7.1	< .01	.01	13.2	401.	0.
1N 36E 1RADD 2	15.2	3.0	1023.	8-18-75	11.0	123.	172.	106.	7.1	.01	.13	11.3	692.	0.
1N 36E 14CCDA		18.4	1058.	9- 4-75	13.0	37.	24.	389.	4.8	.01	.06	7.0	458.	0.
1N 36E 19BA		30.8		8- 1-72	11.0	31.	11.	910.	2.9	< .01	.02	15.0	459.	0.
1N 37E 2AAAA		7.6	998.	6-22-73	11.0	99.	.122.	576.	11.5	.02	< .01	8.1	276.	0.
1N 37E 6ACAD	15.2	9.1	1030.	7- 9-73		4.	186.	227.	5.9	.01	< .01	12.1	383.	76.
1N 37E 7DDDA	29.9	14.2	1044.	8-18-75	10.5	130.	132.	41.	9.1	.01	.01	10.1	417.	0.
1N 37E 14ACCC	39.6		1035.	7-20-72	10.5	162.	132.	142.	6.2	.02	.13	25.9	454.	0.
1N 37E 15BAAD			1000.	7-20-72	10.0	47.	45.	700.	6.7	7.00	.15	27.8	416.	7.
1N 37E 15BBCA	42.7	5.2	997.	7-20-21	14.1	6.	2.	564.	1.8	.05	.02	19.3	679.	16.
1N 37E 20ABCA		45.7	1061.	7-27-73	11.0	101.	139.	137.	5.8	< .01	.03	15.4	490.	0.
1N 37E 22BBAD			1009.	7-20-72	9.5	76.	42.	415.	5.4	1.80	.15	23.5	443.	0.
1N 37E 23DADD	24.4		1069.	7-20-72	12.0	122.	112.	120.	4.3	10.80	.16	25.7	406.	0.
1N 37E 27ADCB	9.1	2.4	1020.	8-13-72	11.0	52.	59.	456.	6.3	< .01	.01	20.5	265.	0.
1N 37E 33AAAB	39.6		1015.	7- 2-73	.9	79.	178.	219.	13.0	< .01	.20	19.4	536.	22.
1N 37E 35CACA			1031.	8-11-72	10.0	44.	99.	55.	6.0	< .01	.01	45.8	278.	2.
1N 38E 6ADDD	44.5	31.4	1053.	8-27-73	10.0	3.	1.	650.	4.0	< .01	< .01	2.4	138.	15.
1N 38E 22CCCC	9.1	1.5	1038.	9-27-73	9.0	74.	139.	56.	6.3	< .01	< .01	13.1	537.	0.
1N 38E 22CCCC	9.1	1.5	1038.	7-18-72	6.0	81.	106.	235.	4.8	3.08	.39	17.1	439.	0.
1N 38E 23BBAD	36.6	18.3	1073.	7- 3-73	12.0	65.	114.	288.	7.3	< .01	< .01	9.9	187.	8.
1N 38E 26DAAA	42.7	2.4	1062.	7- 7-73	11.5	120.	50.	493.	7.9	< .01	.01	9.6	253.	0.
1N 38E 28AAAA	48.8		1039.	6-29-73	12.5	11.	2.	546.	2.4	< .01	< .01	12.8	324.	4.
1N 38E 28AAAA	48.8		1039.	7-18-72	13.0	11.	2.	530.	2.4	.09	.01	19.3	337.	0.
1N 38E 29ADCA 1			1059.	7-21-72	10.0	50.	88.	26.	2.7	.67	.04	23.5	395.	0.
1N 38E 29ADCA 2	30.5		1061.	7-21-72	13.5	57.	70.	22.	2.9	.05	.10	21.4	431.	0.
1N 38E 29ADDC	6.1	1.8	1055.	7-31-72	12.5	44.	125.	27.	3.6	< .01	.08	23.5	548.	3.
1N 38E 29ADDA	6.1		1049.	7-31-72	8.0	80.	146.	81.	3.0	< .01	.01	19.3	486.	0.
1N 38E 29CABD	13.7		1070.	8-11-72	8.2	49.	80.	21.	1.8	< .01	< .01	286.7	336.	0.
1N 38E 31CCCD 1			1076.	8-12-72	12.0	45.	43.	244.	3.4	< .01	.01	28.7	420.	5.
1N 38E 31CCCD 2	50.3	21.3	1077.	1-24-73		245.	106.	39.	2.7	.04	.13	32.1	644.	0.
1N 38E 32BAAA	4.6	1.8	1044.	8-10-72	11.8	37.	46.	4.	16.0	< .01	.01	28.7	314.	2.
1N 38E 32BABD			1075.	8-10-72	12.4	7.	14.	174.	3.2	< .01	< .01	11.6	381.	18.
1N 38E 32BACA	68.6	38.7	1077.	8-10-72	13.5	51.	28.	480.	4.3	< .01	.03	13.7	346.	6.
1N 38E 36BACD			1078.	7-26-73	1.3	105.	58.	429.	8.2	.05	.05	9.2	193.	0.
1N 39E 5CABA	91.4		1123.	7- 5-73	12.0	20.	8.	745.	4.1	.08	.03	6.4	258.	0.
1N 39E 19CAAB			1157.	10- 4-73	9.0	29.	18.	825.	4.7	.01	< .01	7.4	496.	19.
1N 39E 24BABC	37.2	18.9	1164.	9-27-73	12.0	130.	192.	213.	10.5	.02	.05	12.7	462.	0.
1N 39E 30BCAC			1186.	10- 4-73	13.1	31.	220.	1093.	6.5	< .01	.15	10.3	618.	0.
1N 39E 31AAAC			1152.	7-27-73	10.5	55.	149.	238.	10.0	< .01	.03	12.1	334.	0.
1N 40E 2BAD	13.4	10.2	1168.	7-19-73	9.0	46.	35.	6.	1.9	.02	.01	11.0	234.	0.
1N 40E 2CDCC	30.5	12.9	1070.	10- 2-73	11.0	110.	107.	37.	3.9	< .01	< .01	12.8	376.	0.
1N 40E 12CBA	12.2	10.4	1036.	11- 2-72	10.5	105.	160.	78.	5.8	.08	.01	62.0	447.	0.
1N 40E 13ABAA			1044.	10- 2-73	11.0	166.	204.	124.	8.3	< .01	< .01	18.3	361.	0.
1N 40E 14BABB 1			1048.	10-19-77	11.0	100.	144.	81.	7.2	.01	.01	13.7	532.	0.
1N 40E 14BABB 1			1048.	10- 3-73	10.0	57.	145.	94.	8.0	< .01	< .01	12.7	420.	0.
1N 40E 14BABB 2		6.1	1048.	10- 3-73		33.	136.	79.	7.6	< .01	< .01	13.5	354.	0.
1N 40E 15BBCA			1061.	9-24-73	11.0	91.	110.	104.	4.3	< .01	.01	19.6	374.	0.
1N 40E 29ACAA	70.7		1084.	9-24-73	11.0	16.	5.	650.	3.6	< .01	< .01	6.5	462.	0.
1N 40E 35DABC	9.1	7.0	1005.	3-24-76	9.0	151.	202.	585.	7.4	.32	.02	13.6	602.	0.
1N 41E 3CDDD	26.2	20.3	1015.	8-20-73	11.5	13.	145.	63.	5.0	2.70	.22	9.6	256.	18.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
1N 36E 18ADD	7- 9-73	652.	6.5	< .1	.14	1178.	1.7	1640.	8.18	MRMG	UNKNOWN
1N 36E 18ADD 2	A-18-75	643.	5.4	.1	.36	1408.	1.4	1878.	7.78	USGS	SUB-ROBINSON
1N 36E 19CCDA	9- 4-75	639.	10.4	.3	.50	1338.	12.2	1979.	8.12	USGS	SUB-ROBINSON
1N 36E 19BB	A- 1-72	1628.	13.8	.4	1.08	2839.	35.9	3430.	8.30	MRMG	TULLOCK SAND
1N 37E 28AAA	6-22-73	1734.	12.1	.1	1.36	2702.	9.2	3414.	8.06	MRMG	SUB-ROBINSON
1N 37E 36CAD	7- 9-73	830.	6.5	< .1	.07	1534.	3.5	2074.	9.00	MRMG	SUB-ROBINSON
1N 37E 7DDDA	A-18-75	592.	19.1	.2	5.70	1164.	.9	1582.	7.23	USGS	SUB-ROBINSON
1N 37E 14ACCC	7-20-72	820.	8.5	.5	.41	1521.	2.0	2000.	7.65	MRMG	SUB-ROBINSON
1N 37E 15BAAD	7-20-72	1440.	11.7	.3	.16	2498.	17.5	3340.	8.54	MRMG	SUB-ROBINSON
1N 37E 15BBCA	7-20-21	635.	6.1	.3	< .02	1584.	52.0	2320.	8.70	MRMG	SUB-ROBINSON
1N 37E 20ABCA	7-27-73	720.	5.8	.1	< .02	1365.	2.1	1835.	7.71	MRMG	SUB-ROBINSON
1N 37E 22BBAD	7-20-72	850.	6.1	.4	< .02	1647.	9.5	2230.	8.20	MRMG	SUB-ROBINSON
1N 37E 23BACD	7-20-72	676.	9.5	.3	< .02	1280.	1.9	1690.	7.79	MRMG	ROBINSON COAL
1N 37E 27BDCB	A-13-72	1103.	5.4	.3	.32	1838.	10.3	2430.	8.30	MRMG	SUB-ROBINSON
1N 37E 33AABB	7- 2-73	918.	10.0	.2	.14	1722.	3.1	2270.	8.00	MRMG	SUB-ROBINSON
1N 37E 35CBCA	A-11-72	390.	4.3	.3	.36	784.	1.1	1089.	8.39	MRMG	ALLUV.SARPY TRIB
1N 38E 8ADAD	A-27-73	1224.	12.6	.4	.52	1981.	80.8	2780.	8.78	MRMG	SUB-ROBINSON
1N 38E 22CCCC	9-27-73	420.	5.4	.2	.68	979.	.9	1398.	8.00	MRMG	ROSEBUD-MCKAY OB
1N 38E 22CCCC	8-18-72	767.	10.7	.3	< .02	1441.	4.0	1960.	7.94	MRMG	ROSEBUD-MCKAY OB
1N 38E 23BABB	7- 3-73	1070.	7.2	< .1	.38	1654.	5.0	2170.	8.07	MRMG	SUB-ROBINSON
1N 38E 24DBAA	7- 7-73	1292.	7.1	< .1	.84	2104.	9.6	2777.	8.25	MRMG	SUB-ROBINSON
1N 38E 28AAAA	6-29-73	944.	9.4	.3	.23	1701.	40.9	2310.	8.39	MRMG	SUB-ROBINSON
1N 38E 28AAAA	7-18-72	880.	9.8	.4	.07	1621.	38.5	2290.	8.05	MRMG	SUB-ROBINSON
1N 38E 29ADCA 1	7-21-72	160.	32.4	.1	4.86	583.	.5	925.	8.06	MRMG	ROSEBUD-MCKAY C.
1N 38E 29ADCA 2	7-21-72	120.	7.8	.2	.68	514.	.5	816.	8.07	MRMG	ROSEBUD-MCKAY C.
1N 38E 29ADDC	7-31-72	196.	8.5	.2	1.06	696.	.4	1050.	8.32	MRMG	ROSEBUD-MCKAY OB
1N 38E 29ADDA	7-31-72	540.	10.3	.3	.56	1119.	1.2	1520.	7.95	MBMG	ROSEBUD-MCKAY OB
1N 38E 29CABD	A-11-72	152.	28.1	.1	7.00	791.	.4	834.	8.16	MRMG	ROSEBUD-MCKAY C.
1N 38E 31CCCD 1	8-17-72	445.	3.6	.1	.66	1025.	6.2	1470.	8.44	MRMG	UNKNOWN
1N 38E 31CCCD 2	1-24-73	568.	8.0	< .1	.09	1318.	.5	1680.	7.33	MRMG	ROBINSON COAL
1N 38E 32CBAA	A-10-72	42.	1.8	.2	.41	332.	.1	540.	8.33	MRMG	ALLUV.SARPY TRIB
1N 38E 32BABD	A-10-72	102.	5.2	.1	.34	523.	8.8	909.	8.81	MRMG	UNKNOWN
1N 38E 32BBCA	A-10-72	951.	5.0	.1	.16	1710.	13.4	2290.	8.45	MRMG	SUB-ROBINSON
1N 38E 36BACD	7-26-73	1216.	6.9	< .1	2.71	1923.	8.2	2510.	8.15	MRMG	UNKNOWN
1N 39E 5CABA	7- 5-73	1402.	12.6	.5	.05	2326.	35.4	3140.	8.18	USGS	ROSEBUD OB.
1N 39E 19CAAB	10- 4-73	1478.	6.6	1.3	.59	2634.	29.5	3582.	8.47	MRMG	UNKNOWN
1N 39E 24BBBC	9-27-73	1085.	9.4	< .1	.56	1870.	2.8	2423.	7.78	MRMG	UNKNOWN
1N 39E 30BCAC	10- 4-73	2506.	82.0	.1	17.39	4270.	15.2	5258.	8.09	MRMG	UNKNOWN
1N 39E 31AAAC	7-27-73	949.	4.2	.1	.27	1591.	3.8	2100.	8.10	MRMG	UNKNOWN
1N 40E 2ABA	7-19-73	58.	7.0	.1	3.48	282.	.1	483.	7.87	USGS	ROSEBUD COAL
1N 40E 2CDCC	10- 2-73	463.	3.7	.2	.16	922.	.6	1258.	8.09	MBMG	ROSEBUD COAL
1N 40E 12CBA	11- 2-72	690.	4.6	.2	.36	1326.	1.1	1660.	7.82	USGS	ALLUV. E.&ARMELLS
1N 40E 13ABAA	10- 2-73	1185.	7.0	.1	1.06	1891.	1.5	2298.	7.85	MRMG	UNKNOWN
1N 40E 14BBBB	10-19-77	558.	11.5	.3	2.03	1179.	1.2	1605.	7.88	MRMG	UNKNOWN
1N 40E 14BBBB 1	10- 3-73	585.		.2	2.28	1110.	1.5	1542.	8.04	MRMG	UNKNOWN
1N 40E 14BBBB 2	10- 3-73	490.	8.9	.2	4.18	956.	1.4	1344.	8.19	MRMG	UNKNOWN
1N 40E 15BBCA	9-24-73	586.	4.2	.1	.16	1103.	1.7	1520.	7.71	MRMG	UNKNOWN
1N 40E 29ACBA	9-24-73	1045.	7.4	< .1	.54	1961.	36.2	2756.	8.23	MBMG	SUB-MCKAY
1N 40E 35DBBC	3-24-76	1861.	13.2	.3	.03	3130.	7.3	3835.	7.84	USGS	ROSEBUD OB
1N 41E 7CDDD	A-20-73	490.	8.6	< .1	.14	881.	1.1	1240.	8.49	USGS	ROSEBUD COAL

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPER-ATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
1N 41E 7DARA	39.1		1024.	10- 3-73	11.0	118.	89.	27.	3.9	.06	.06	39.5	283.	9.
1N 41E 8DADC	118.A		1012.	3-19-73	13.0	14.	3.	603.	3.6	.65	.02	15.2	413.	0.
1N 41E 8CAAA	30.5		1023.	10- 2-73	11.0	35.	70.	27.	3.2	< .01	< .01	15.0	366.	0.
1N 41E 8CAAB 1	30.5	6.1	1023.	3-18-73	9.0	72.	74.	26.	3.0	.10	.02	40.6	451.	0.
1N 41E 12CADB			1027.	8- 2-73	15.5	62.	104.	320.	7.4	.10	.05	12.0	303.	0.
1N 41E 26ACAA	59.4	7.0	972.	4- 6-76		162.	317.	152.	9.3	.02	.01	17.5	590.	0.
1N 41E 26ACAB	59.4	7.0	972.	2-27-76		150.	334.	151.	9.5	.03	< .01	16.9	595.	0.
1N 42E 10CCDC	13.1	5.7	937.	10-18-72	10.5	246.	325.	182.	8.2	.14	.01	47.1	319.	0.
1N 42E 19DARA	26.4	6.5	954.	8- 7-73	11.0	45.	109.	170.	5.6	.33	.08	12.0	369.	15.
1N 42E 22CABD	16.A		930.	9- 6-73	11.0	253.	380.	514.	11.0	1.77	.23	10.7	477.	0.
1N 42E 25BCDD	28.7	4.3	893.	9- 6-73		113.	102.	818.	12.7	.01	< .01	8.7	518.	4.
1N 42E 28BADC	16.2	5.3	911.	8-30-73	10.0	38.	145.	292.	7.0	.70	.08	11.8	321.	15.
1N 42E 33ADBC	12.8	6.3	905.	9-28-72	10.0	111.	122.	620.	12.0	3.08	.14	59.9	515.	0.
1N 42E 34ACAB	83.A	2.3	902.	2- 1-73		30.	10.	440.	5.0	.02	.03	19.3	454.	0.
1N 43E 2CCDA	15.2	12.5	917.	9-28-73	10.5	36.	47.	45.	2.6	< .01	< .01	9.4	196.	0.
1N 43E 9DDDA			904.	9-29-73	11.5	170.	378.	362.	9.6	.01	.03	14.7	186.	0.
1N 43E 17AACA		11.9	884.	10-18-72	10.5	5.	2.	440.	1.4	.28	.01	19.3	480.	0.
1N 43E 33BABA	10.1	5.7	911.	10- 3-73	10.5	89.	125.	73.	8.0	< .01	< .01	25.2	294.	0.
1N 44E 4DABD	13.7	6.7	881.	6-13-75	12.0	29.	16.	1220.	5.8	.02	.04	6.9	795.	0.
1N 44E 7AADA		14.1	901.	11-29-72	11.0	280.	400.	470.	6.9	.68	.56	23.5	479.	0.
1N 44E 10CDBC	50.3	29.3	869.	9-30-73	12.5	14.	6.	420.	3.6	< .01	< .01	8.7	464.	20.
1N 44E 12CBCA	152.4		938.	8-12-73	16.0	3.	1.	580.	1.7	< .01	< .01	10.1	1062.	39.
1N 44E 14BADC 1	213.4		840.	9-25-73	14.5	3.	1.	510.	1.6	< .01	< .01	8.7	981.	53.
1N 44E 14BADC 2	9.1		840.	9- 4-75	12.0	177.	152.	620.	14.4	.03	< .01	21.5	830.	0.
1N 44E 27CBAC			853.	9-13-73	14.0	3.	1.	525.	1.7	< .01	< .01	9.4	1055.	53.
1N 44E 29ACBD			882.	9-13-73	11.0	114.	98.	210.	9.6	< .01	< .01	11.1	203.	0.
1N 44E 31AABA	21.3	.9	924.	9-13-73	13.0	3.	1.	364.	1.7	< .01	< .01	8.6	449.	34.
1N 44E 3DBDD	202.1	10.1	908.	7-22-76	11.0	118.	402.	6.5	.72	.11	.11	8.2	612.	0.
1N 44E 6ACBC	28.3		904.	10- 5-76	10.6	135.	180.	337.	6.3	5.50	.18	9.7	838.	0.
1N 46E 26ABCB	228.6	121.9	973.	7-21-76	15.5	3.	1.	291.	1.6	.05	< .01	7.7	639.	15.
1N 46E 30BCCA	29.3	21.6	942.	7-21-76	12.0	128.	108.	488.	7.8	2.95	.51	11.6	500.	0.
1N 47E 4CCAA	43.0	8.1	965.	7-13-76	11.0	88.	96.	186.	5.1	.08	< .01	11.7	415.	0.
1N 47E 20AADC	33.5	9.3	949.	7- 7-76	13.0	286.	180.	406.	9.0	.05	.05	10.8	550.	0.
1N 47E 23DBDD	36.6	6.1	942.	7- 8-76	10.5	104.	76.	854.	5.8	1.37	.22	8.9	786.	0.
1N 47E 27CACD	36.6	18.3	954.	7- 8-76	11.5	35.	25.	600.	3.5	.09	.04	7.9	544.	0.
1N 47E 35ARCC	27.4	12.2	991.	7- 7-76	12.0	155.	118.	160.	4.3	.55	.15	11.0	549.	0.
1N 48E 22ACBB	45.1	13.9	938.	6-29-76	14.0	9.	3.	748.	2.4	.02	.03	6.8	489.	5.
1N 48E 28CDAD	22.6	2.1	931.	6-29-76	10.5	72.	34.	880.	4.6	.17	.20	9.5	438.	9.
1N 49E 18BDAA	45.7	12.2	908.	6-15-76	11.0	7.	3.	680.	2.2	.08	.01	8.6	924.	7.
1N 49E 25AACB	106.1	4.5	985.	7- 1-76	11.5	103.	61.	13.	5.6	.09	.01	14.1	429.	0.
1N 49E 26CABD	70.7	45.7	1038.	7- 2-76	11.0	102.	55.	19.	2.7	.52	.53	13.4	512.	0.
1N 49E 30DABC	17.7	3.5	920.	6-30-76	10.5	196.	138.	349.	7.8	3.20	.21	13.4	420.	0.
1N 49E 36ADAD	31.7	21.2	1007.	7- 1-76	14.0	290.	190.	60.	6.3	2.89	.36	17.9	674.	0.
1N 50E 32BAAA	93.0	61.0	1011.	8- 4-76	11.5	170.	141.	148.	6.9	17.40	.26	12.0	485.	0.
1N 52E 26CDAA	26.2	12.8	998.	8-24-76	10.0	82.	40.	52.	3.5	2.34	.43	11.6	446.	0.
1S 37E 1BAAD	54.9	30.5	1067.	9-11-73	11.1	67.	61.	633.	6.0	< .01	< .01	8.3	337.	0.
1S 37E 3AARD			1025.	7- 5-73	9.5	54.	136.	124.	7.9	< .01	< .01	27.1	510.	0.
1S 37E 6CCBB	29.6	18.3	1045.	7- 3-73		8.	37.	211.	5.8	< .01	< .01	2.5	417.	17.
1S 37E 19BCDB			1067.	9-10-73	11.0	43.	207.	149.	8.2	< .01	< .10	14.1	209.	0.
1S 38E 3CACC	54.9	24.4	1113.	6-27-73	11.7	25.	51.	22.	3.1	< .01	< .01	2.0	284.	1.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY	COLLECTING AGENCY	CONTRIBUTING AQUIFER
1N 41E 7DARA	10- 3-73	427.	6.1	.2	4.52	864.	.5	1160.	8.48	MRMG	ROSEBUD COAL
1N 41E 8ABDC	3-19-73	978.	7.9	.4	< .02	1829.	37.5	2610.	8.04	W EL	SUB-MCKAY
1N 41E 8CBAA	10- 2-73	118.	4.3	< .1	.52	454.	.6	776.	8.12	MRMG	ROSEBUD COAL
1N 41E 8CBAA 1	3-18-73	147.	5.9	.2	.93	592.	.5	869.	7.51	W EL	ROSEBUD COAL
1N 41E 12CHOR	8- 2-73	1300.	12.0	< .1	.56	2047.	4.6	2540.	8.10	USGS	UNKNOWN
1N 41E 26ACAA	4- 6-76	1429.	12.2	.2	.73	2390.	1.6	2960.	7.96	MRMG	SUB-MCKAY
1N 41E 26BCAA	2-27-76	1481.	13.2	.2	.59	2449.	1.6	2949.	7.73	USGS	SUB-MCKAY
1N 42E 10CCDC	10-18-72	1998.	16.5	.4	< .02	2980.	1.8	3160.	7.97	USGS	ALLUV.SFK.COW CR
1N 42E 19DABA	8- 7-73	568.	8.5	.2	.07	1115.	3.1	1510.	8.42	USGS	MCKAY COAL
1N 42E 22CARD	9- 6-73	2790.	16.9	.2	.05	4212.	4.8	4696.	8.02	USGS	ALLUV.ROSEBUD CR
1N 42E 25BCDD	9- 6-73	1920.	16.8	.6	.05	3750.	13.4	4000.	8.34	USGS	SUB-MCKAY
1N 42E 28ADDC	8-30-73	834.	9.9	.2	.11	1422.	3.3	1906.	8.68	USGS	SUB-MCKAY
1N 42E 33AOBC	9-28-72	1642.	15.8	.5	.02	2840.	9.7	3490.	8.16	USGS	SUB-MCKAY
1N 42E 34ACAB	2- 1-73	758.	10.2	.6	.86	1547.	20.0	2420.	7.94	USGS	SUB-MCKAY
1N 43E 2CCDA	9-28-73	206.	6.7	.1	.12	449.	1.2	707.	7.98	USGS	AL. SAND COULEE
1N 43E 9DDDA	9-29-73	2526.	17.9	< .1	5.87	3576.	3.5	3750.	7.71	USGS	UNKNOWN
1N 43E 17AACA	10-18-72	565.	13.2	2.2	.23	1285.	41.7	2050.	8.05	USGS	SUB-MCKAY
1N 43E 33BABA	10- 1-73	642.	4.6	.1	< .02	1111.	1.2	1410.	7.85	USGS	AL. GREENLEAF CR
1N 44E 4DABD	6-13-75	1982.	42.8	.9	1.94	3695.	45.4	5436.	7.98	USGS	SUB-TERRET
1N 44E 7AADA	11-29-72	2815.	30.0	.2	1.72	4264.	4.2	4530.	7.73	USGS	SUB-TERRET
1N 44E 10CDBC	9-30-73	494.	12.3	1.1	.36	1209.	23.5	1780.	8.70	USGS	SUB-TERRET
1N 44E 12CBCA	9-12-73	73.	83.0	6.0	.07	1236.	75.5	1908.	8.63	USGS	DEEP SANDSTONE
1N 44E 14ABDC 1	9-25-73	66.	115.0	6.0	.14	1246.	70.9	1994.	8.54	USGS	DEEP SANDSTONE
1N 44E 14BBDC 2	9- 4-73	1631.	46.2	.3	7.41	3078.	9.3	3960.	6.51	USGS	ALLUV.TONGUE R.
1N 44E 27CBAC	9-13-73	1.	126.0	.9	.07	1239.	72.4	2036.	8.85	USGS	UNKNOWN
1N 44E 29ACBD	9-13-73	948.	10.3	.4	1.69	1503.	3.5	1946.	8.28	USGS	SUB-TERRET
1N 44E 31AAPA	9-13-73	332.	13.9	1.7	.50	981.	48.9	1552.	8.88	USGS	SUB-TERRET
1N 46E 3DADD	7-22-75	1365.	18.0	.3	.04	2405.	5.4	3101.	7.72	USGS	UNKNOWN
1N 46E 6ACBC	10- 5-76	1067.	26.0	.5	.02	2179.	4.5	2892.	7.38	USGS	BASAL TR SS
1N 46E 26ABCB	7-21-76	61.	13.1	1.8	.43	718.	38.4	1140.	8.61	USGS	TULLOCK
1N 46E 30BCCB	7-21-76	1379.	8.2	.4	< .02	2379.	7.7	3086.	7.57	USGS	SUB-KNODLOCH
1N 47E 4CCAA	7-13-76	648.	5.0	.4	3.16	1246.	3.3	1706.	7.80	USGS	BASAL TONGUE R.
1N 47E 20AADC	7- 7-76	1777.	6.2	.2	< .02	2945.	4.6	3612.	7.64	USGS	BASAL TONGUE R.
1N 47E 23DBDD	7- 8-76	1691.	10.8	.3	< .02	3136.	15.7	4274.	7.76	USGS	BASAL TONGUE R.
1N 47E 27CACD	7- 8-76	1007.	7.3	.2	.03	1954.	18.9	2903.	7.89	USGS	BASAL TONGUE R.
1N 47E 35ABCC	7- 7-76	721.	10.3	.2	.22	1451.	2.4	2019.	7.61	USGS	KNODLOCH
1N 48E 22ACAB	6-29-76	1199.	13.2	.7	.86	2227.	57.2	3226.	8.37	USGS	BASAL TONGUE R.
1N 48E 28COAD	6-29-76	1830.	11.0	.4	.24	3057.	21.5	4347.	7.72	USGS	BASAL TONGUE R.
1N 49E 18BDAA	6-18-76	684.	21.9	2.7	.70	1880.	56.6	2780.	8.36	USGS	LEBO
1N 49E 25AACB	7- 1-76	162.	7.1	.1	1.92	577.	.3	981.	7.85	USGS	UNKNOWN
1N 49E 26CBAD	7- 2-76	103.	2.7	.3	< .02	551.	.4	911.	7.72	USGS	BASAL TONGUE R.
1N 49E 30DBAC	6-30-76	1408.	8.4	.3	.11	2331.	4.7	2935.	7.70	USGS	ALLUVIUM SL CR
1N 49E 36ADAD	7- 1-76	1019.	5.3	.1	.06	1923.	.7	2364.	7.36	USGS	BASAL TONGUE R.
1N 50E 32BAAA	8- 4-76	902.	7.0	< .1	.13	1642.	2.0	2186.	7.14	USGS	LEBO
1N 52E 26COAA	8-24-76	110.	5.5	.4	< .02	526.	1.2	843.	7.29	USGS	BASAL TONGUE R.
1S 37E 1BAAD	9-11-73	1476.	15.5	.2	.41	2433.	13.5	3287.	8.20	MRMG	SUB-ROBINSON
1S 37E 3AAAD	7- 5-73	519.	5.6	.3	< .02	1125.	2.0	1510.	8.06	MRMG	UNKNOWN
1S 37E 6CCBB	7- 3-73	262.	8.3	< .1	.45	757.	7.0	1153.	8.78	MRMG	SUB-ROBINSON
1S 37E 13RCDB	9-10-73	1100.	5.9	< .1	.86	1630.	2.1	2091.	8.23	MRMG	UNKNOWN
1S 38E 3CACC	6-27-73	84.	2.4	.2	.93	331.	.8	578.	8.35	MRMG	ROSEBUD-MCKAY OB

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
1S 3AE 3CACC	54.9	24.4	1113.	8-10-72	11.8	53.	64.	22.	2.7	< .01	.02	23.5	358.	0.
1S 3AF 9ACAA	36.6	4.7	1072.	7-18-72	9.2	70.	97.	45.	2.4	2.10	.08	27.8	510.	0.
1S 3AF 9BADD	24.4		1069.	1- 6-73	9.0	71.	96.	62.	4.2	.04	< .01	14.2	356.	0.
1S 3AE 9BADD	24.4		1069.	7-18-72	10.0	82.	96.	62.	4.3	1.20	.09	32.1	433.	0.
1S 3AE 9BDDA	25.6	1.8	1069.	8- 1-72	10.0	104.	140.	143.	7.4	< .01	.01	23.5	256.	0.
1S 3AF 9CAAA	29.9	5.3	1075.	8- 1-72	11.0	90.	65.	182.	4.3	< .01	.02	34.2	517.	0.
1S 3AE 12BABA	79.2	45.7	1113.	9-13-73	12.0	87.	321.	238.	7.9	< .01	.21	12.1	415.	0.
1S 3AE 13CABA		34.7	1155.	9-13-73	11.1	152.	310.	154.	11.2	.02	.02	16.6	112.	0.
1S 4AE 7BADA	128.0	67.1	1091.	9-12-73	13.0	92.	122.	435.	7.6	< .01	< .01	12.1	235.	0.
1S 4AE 24ABB	24.7	11.4	960.	9- 7-73		143.	195.	159.	10.1	< .01	.10	16.6	424.	0.
1S 4AE 5CDAA	45.7	12.9	981.	3-24-76	10.0	101.	72.	538.	6.8	3.62	.05	8.8	478.	0.
1S 4AF 17DAAD	13.7	7.3	966.	12- 1-72	10.5	120.	161.	295.	4.8	.08	.01	40.6	404.	0.
1S 4AE 23BACA	75.6	6.4	936.	2-27-76	12.5	6.	2.	410.	2.1	< .01	.01	7.1	396.	0.
1S 4AF 23BDAA	75.6	6.4	937.	2-27-76	12.0	8.	3.	410.	2.3	.12	.01	6.9	393.	0.
1S 4AE 32CABA		18.3	963.	10-27-72	12.0	191.	284.	290.	9.1	1.10	.14	38.5	329.	0.
1S 4AF 33DACA	36.6	5.0	953.	10-27-72		7.	2.	410.	2.1	< .01	.02	21.4	400.	0.
1S 4ZF 5ADAA	41.1	18.3	936.	2-27-76		62.	104.	840.	6.2	.03	.02	6.9	720.	0.
1S 4ZE 12CADC	9.1	.3	930.	10- 1-73	9.5	76.	141.	220.	9.0	< .01	.02	25.2	340.	0.
1S 4ZF 11BDDC	6.4		942.	10- 1-73	10.5	67.	101.	85.	8.2	< .01	.01	29.3	288.	0.
1S 4ZF 11CACA	22.9	7.4	946.	11-29-72	9.5	132.	119.	140.	5.0	.04	.05	47.1	470.	0.
1S 4AE 8BCAD	18.0	10.3	888.	9-28-72	11.0	127.	135.	200.	15.0	1.15	.13	42.8	376.	0.
1S 4SF 1CABA	61.6		957.	9-20-72	13.0	107.	93.	427.	6.9	.08	.10	23.5	644.	0.
1S 4SF 10BADC			902.	10-30-74	9.5	77.	164.	421.	15.3	< .01	< .01	29.0	351.	14.
1S 4AE 20BAA		45.7	960.	10- 9-74	14.0	110.	96.	269.	13.8	< .01	.06	12.3	635.	0.
1S 4AE 29BAC	33.5	17.1	970.	10-31-74	10.0	146.	130.	70.	7.4	.02	.13	15.0	629.	0.
1S 4AE 30ADCA 1		56.4	963.	10-29-74	13.0	4.	2.	299.	1.8	< .01	< .01	7.1	649.	48.
1S 4AE 30ADCA 2			963.	10-29-74	10.5	121.	243.	217.	13.2	.02	< .01	14.9	303.	0.
1S 4AE 33DADB	33.5	22.9	998.	10-29-74	10.0	35.	163.	327.	16.4	< .01	< .01	22.4	415.	9.
1S 4AE 34CBA		39.6	994.	10- 9-74	12.5	169.	125.	400.	9.5	.02	.08	9.4	678.	0.
1S 4AF 36CDCD	70.1	43.6	1052.	6-22-76	13.5	94.	112.	386.	14.0	.30	.07	11.3	736.	0.
1S 4TF 11DDDD	48.8	32.9	1020.	7- 1-76	12.0	85.	102.	353.	9.7	2.27	.21	7.3	442.	0.
1S 4TE 20ACDA		34.2	1118.	6-24-76	13.0	109.	103.	760.	9.9	1.74	.04	10.5	754.	0.
1S 4TE 26CABA	176.8	85.3	1021.	6-29-76	14.5	2.	0.	275.	1.2	.31	< .01	8.7	642.	12.
1S 4TE 27DARD	18.3	7.5	1030.	4- 7-76	10.0	87.	95.	302.	11.0	.17	.02	16.3	702.	0.
1S 4TE 28ACCD	72.2	56.1	1066.	6-29-76	11.0	66.	43.	862.	8.1	3.68	.22	7.8	945.	0.
1S 4TE 34AACD	30.5	15.2	1049.	6-29-76	11.0	75.	73.	105.	6.6	.02	.01	14.5	502.	0.
1S 4RE 17BARC	243.8	57.9	981.	6-30-76	15.5	2.	0.	312.	1.4	.06	< .01	7.1	489.	15.
1S 4RE 17DDDD	37.5	19.3	971.	6-30-76	12.0	163.	277.	694.	12.1	.98	.37	9.3	559.	0.
1S 4RF 20DCAC	34.4	21.8	998.	7- 1-76	11.5	190.	130.	408.	7.3	1.55	.69	10.8	627.	0.
1S 4RE 24CACD	79.2	27.4	963.	7- 7-76	13.0	2.	1.	257.	1.1	.11	.01	7.6	468.	8.
1S 4RE 9CBAD	61.0	24.4	948.	7- 8-76	13.0	3.	1.	386.	1.4	.04	< .01	7.7	792.	28.
1S 4RE 14ADCC	121.9	61.1	1000.	7-12-76	13.5	60.	24.	625.	4.1	1.92	.08	10.5	386.	0.
1S 4RE 18BDBA	82.3	54.9	935.	7- 1-76	18.0	4.	1.	374.	1.4	.22	.01	7.1	894.	0.
1S 4RE 23CACD	38.4	37.0	1012.	7- 8-76	12.0	332.	220.	89.	6.6	1.11	.42	13.5	547.	0.
1S 4RE 31BDCC	15.2	7.3	957.	7- 7-76	9.0	190.	220.	544.	18.1	1.87	1.71	27.2	624.	0.
1S 5QE 22BDDD	345.9	27.2	966.	7- 7-76	14.0	475.	315.	570.	6.9	.11	.04	10.9	453.	0.
1S 5QF 33CDCC	94.2	30.5	1017.	7- 7-76	14.0	328.	200.	222.	8.1	12.70	.09	14.2	551.	0.
1S 5QE 36BDCD	61.0	21.4	974.	7- 8-76	14.0	8.	3.	496.	2.1	.89	.01	6.3	498.	0.
1S 5ZF 11DA	11.9	5.9	823.	7-27-76	10.5	125.	91.	548.	5.4	1.86	.94	9.8	846.	0.
2S 1JF 2DAAC	45.7	42.0	1045.	11-30-72	11.5	259.	313.	714.	28.6	.04	.28	34.2	648.	0.

NOTE
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Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (SAR)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
15 3AE 3CACC	8-10-72	145.	1.9	<.1	.25	489.	.5	733.	8.08	MRMG	ROSEBUD-MCKAY OB
15 3AE 9ACPH	7-18-72	238.	4.7	<.1	< .02	738.	.8	1060.	8.27	MRMG	ROSEBUD-MCKAY C.
15 3AE 9HADD	1- 6-75	385.	6.5	< .1	.05	814.	1.1	1173.	8.10	MRMG	ROSEBUD-MCKAY C.
15 3AE 9HADD	7-18-72	364.	7.6	< .1	< .02	862.	1.1	1230.	7.86	MRMG	ROSEBUD-MCKAY C.
15 3AE 9HDDA	8- 1-72	901.	6.8	< .1	.66	1452.	2.2	1780.	8.04	MRMG	ROSEBUD-MCKAY C.
15 3AE 9CAAA	8- 1-72	441.	4.1	<.1	.36	1075.	3.6	1370.	8.12	MRMG	ROSEBUD-MCKAY C.
15 3AE 12HADH	9-13-73	1430.	.1	< .1	.25	2501.	2.6	2460.	7.69	MRMG	ROSEBUD-MCKAY C.
15 3AE 13CADA	9-13-73	1872.	5.4	< .1	1.02	2577.	1.6	2955.	7.58	MRMG	UNKNOWN
15 4AE 7DADA	9-12-73	1442.	5.5	< .1	.75	2232.	1.0	2906.	8.23	USGS	UNKNOWN
15 4AE 2AABB	9- 7-73	1112.	9.9	<.1	.36	1854.	2.0	2348.	8.01	USGS	SUB-MCKAY
15 4AE 5CDAA	3-24-76	1280.	11.2	.5	.05	2259.	10.0	2957.	7.80	USGS	ROSEBUD OB
15 4AE 17DAAD	12- 1-72	1214.	10.0	.1	.84	2045.	4.1	2420.	7.93	USGS	SUB-MCKAY
15 4AE 23BACH	7-27-76	571.	9.0	.5	.55	1203.	37.4	1820.	8.24	USGS	SUB-MCKAY
15 4AE 23HDBB	2-27-76	568.	4.2	.5	.52	1202.	31.5	1820.	8.20	USGS	SUB-MCKAY
15 4AE 32CABA	10-27-72	1930.	9.6	.2	< .02	2915.	3.1	3220.	7.89	USGS	SUB-ROSEBUD
15 4AE 33HBCB	10-27-72	549.	8.8	.9	.18	1197.	36.6	1870.	7.83	USGS	SUB-MCKAY
15 4AE 5ADBA	2-27-76	1491.	13.4	.7	1.88	3079.	15.2	4347.	8.10	USGS	BASAL TONGUE R.
15 4AE 12CADC	10- 1-73	952.	4.4	<.1	.06	1595.	3.5	2010.	8.13	USGS	ALLUV. MILLER CR
15 4AE 11HDDC	10- 1-73	514.	6.4	.2	< .02	953.	1.5	1270.	8.23	USGS	AL. GREENLEAF CR
15 4AE 11CACB	11-29-72	704.	7.1	.3	.63	1388.	2.1	1740.	7.98	USGS	ROSEBUD COAL ?
15 4AE 8DCAD	9-28-72	971.	6.5	.6	.02	1694.	2.9	2050.	7.86	USGS	SUB-ROSEBUD
15 4AE 1CABB	9-29-72	1009.	3.5	.4	.07	1987.	7.3	2550.	8.26	USGS	SUB-TERRET
15 4AE 10BADC	10-30-74	1416.	6.5	.4	.09	2316.	6.2	2915.	8.48	USGS	UNKNOWN
15 4AE 29HAA	10- 9-74	724.	4.2	.5	.18	1542.	4.5	2082.	8.16	USGS	UNKNOWN
15 4AE 28DAC	10-31-74	505.	5.3	.4	.95	1148.	1.0	1648.	7.82	USGS	SUB-KNOBLOCH
15 4AE 30ADCA 1	10-29-74	26.	14.2	3.5	.43	726.	33.1	1185.	8.98	USGS	UNKNOWN
15 4AE 30ADCA 2	10-29-74	1444.	8.7	< .1	5.56	2216.	2.6	2818.	8.22	USGS	UNKNOWN
15 4AE 31DADA	10-29-74	1066.	6.6	.4	1.85	1852.	5.2	2470.	8.44	USGS	KNOBLOCH
15 4AE 34CBA	10- 9-74	1208.	6.4	.3	.59	2262.	5.7	2764.	7.89	USGS	SUB-KNOBLOCH
15 4AE 36CDCD	6-22-76	931.	6.0	.7	.04	1917.	6.4	2614.	7.59	USGS	KNOBLOCH
15 4AE 11DDDD	7- 1-76	1010.	6.3	< .1	.05	1793.	6.1	2501.	7.66	USGS	SUB-KNOBLOCH
15 4AE 29ACDA	6-24-76	1701.	9.5	.2	.04	3072.	12.5	4009.	7.66	USGS	UNKNOWN
15 4AE 26CDBB	6-29-76	3.	35.1	3.7	.03	657.	50.4	1095.	8.53	USGS	TULLOCK
15 4AE 27DDAD	6- 7-76	687.	7.2	.6	.41	1552.	5.3	2160.	7.67	USGS	KNOBLOCH OR.
15 4AE 28ACCD	6-29-76	1378.	8.8	.9	.05	2839.	20.3	3867.	7.83	USGS	KNOBLOCH COAL
15 4AE 34AACD	6-29-76	280.	6.9	.6	.42	807.	2.1	1246.	7.73	USGS	KNOBLOCH OR
15 4AE 17BABC	6-30-76	236.	12.5	1.0	.45	828.	52.7	1305.	8.70	USGS	HELL CR.
15 4AE 17DDDD	6-30-76	2510.	17.1	.3	.10	3959.	7.7	4643.	7.65	USGS	BASAL TONGUE R.
15 4AE 20DCAC	7- 1-76	1297.	7.3	< .1	.81	2361.	6.5	2990.	7.57	USGS	BROADUS COAL
15 4AE 24CACD	7- 7-76	164.	8.4	1.3	.07	882.	36.4	1111.	8.53	USGS	TULLOCK
15 4AE 9CAAD	7- 8-76	112.	20.6	4.9	.84	969.	53.7	1570.	8.64	USGS	TULLOCK
15 4AE 14ADCC	7-12-76	1269.	6.5	.3	< .02	2191.	17.3	3122.	7.51	USGS	UNKNOWN
15 4AE 18BDBA	7- 1-76	6.	51.0	4.2	.13	887.	46.9	1472.	8.30	USGS	TULLOCK
15 4AE 23CACD	7- 8-76	1462.	4.0	.2	.09	2398.	.9	2802.	7.40	USGS	BASAL TONGUE R.
15 4AE 31HDCC	7- 7-76	1988.	11.3	.4	< .02	3309.	5.4	4105.	7.62	USGS	ALL. PUMPKIN CR.
15 5AE 22BDDD	7- 7-76	3185.	23.6	.1	5.20	4814.	5.0	5350.	7.70	USGS	UNKNOWN
15 5AE 33CDCC	7- 7-76	1624.	5.4	<.1	< .02	2686.	2.4	3137.	7.57	USGS	UNKNOWN
15 5AE 36ADCD	7- 8-76	677.	3.8	.8	.17	1442.	38.5	2169.	8.30	USGS	LOWER MEM F.U.
15 5AE 11DB	7-27-76	1144.	5.7	.1	.31	2348.	9.1	3213.	7.51	USGS	LOWER MEM F.U.
25 4JF 20ABC	11-30-72	2840.	20.3	.4	.05	4529.	7.1	4800.	7.65	USGS	SUB-SAWYER

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
25 45E 17CARD	70.1		1015.	4- 6-76	12.5	138.	107.	165.	6.9	12.80	.24	16.0	926.	0.
25 46F 5AAC	39.6	19.7	1005.	10-24-74	11.0	45.	101.	322.	14.1	< .01	< .01	12.4	592.	11.
25 46E 34RCCR	36.6	24.4	1052.	12-21-73	8.0	29.	7.	945.	6.5	< .01	< .01	10.3	918.	16.
25 49E 26AACA	61.0	12.2	1067.	6-20-76	10.0	129.	85.	349.	7.5	8.15	.10	10.4	671.	0.
25 50E 4DDDA		27.0	1036.	7- 8-76	14.0	68.	38.	222.	4.5	3.72	.07	9.8	501.	0.
25 50E 8ADAD	50.3	32.0	1024.	7- 7-76	12.5	19.	5.	508.	2.9	.23	.03	6.9	503.	0.
25 50E 17ADDA	46.3	27.6	1036.	6-28-76	11.0	169.	89.	101.	6.9	4.22	.05		452.	0.
25 50E 36CCRD	33.5	11.3	1000.	7- 8-76	10.5	104.	69.	93.	6.9	.06	.09	10.4	402.	0.
35 44E 11RCAB	105.2	4.6	902.	5-20-75	12.0	3.	1.	392.	2.1	< .01	< .01	7.5	947.	0.
35 44E 13DBRA	283.5	-.1	901.	12-19-73	13.5	4.	2.	580.	2.5	< .01	< .01	8.6	1122.	53.
35 44E 33RDAA	91.4	-1.4	907.	6- 5-75	12.5	2.	0.	328.	1.7	< .01	< .01	7.7	842.	0.
35 45E 3BADD	85.3	36.6	1006.	5-27-75	8.0	104.	114.	980.	11.5	< .01	< .01	9.0	927.	0.
35 45E 5DBRC			970.	5-28-75	9.5	63.	68.	221.	8.5	< .01	< .01	14.6	587.	0.
35 45E 9DDAD	295.7	9.1	977.	6-25-75	11.5	65.	67.	556.	9.1	< .01	< .01	9.0	703.	0.
35 45F 10RAC		38.0	978.	10- 8-74	13.5	57.	67.	367.	6.5	< .01	< .01	6.9	688.	0.
35 45F 13DCRC	52.4	36.3	975.	1-14-74	10.5	42.	25.	825.	5.4	< .01	< .01	8.8	1054.	0.
35 45F 15DDDA	85.3	40.2	967.	12-17-73	10.0	11.	3.	473.	3.0	< .01	< .01	7.7	566.	0.
35 45F 19DDRD	85.3	-.0	983.	8-13-75		2.	1.	350.	1.7	< .01	< .01	7.6	815.	0.
35 45F 19DDPD	85.3	-.0	983.	12-18-73	7.5	3.	1.	345.	1.5	< .01	< .01	8.0	762.	29.
35 45E 22RAAA	76.2	27.7	958.	1-12-74	14.0	75.	73.	329.	10.3	< .01	< .01	11.2	608.	11.
35 45E 22RARA	24.4	15.2	938.	12-20-73	8.5	77.	70.	138.	12.7	< .01	< .01	27.2	495.	0.
35 45F 23DADA	45.7	18.3	945.	12-21-73	11.0	3.	1.	296.	1.2	< .01	< .01	8.6	762.	7.
35 45E 24ACDA	44.2	24.4	953.	5-28-75	9.0	78.	176.	552.	17.4	.06	.04	11.3	701.	0.
35 45E 31DCDA	51.2	43.0	954.	8-13-75		91.	186.	744.	34.5	.01	< .01	14.1	546.	0.
35 45E 32DDAC	113.4	-.0	917.	2-26-76		1.	2.	348.	1.7	.04	< .01	7.6	835.	0.
35 45E 33RCAA	274.3	-.0	914.	12-18-73	12.5	3.	0.	355.	1.5	< .01	< .01	8.0	793.	20.
35 45E 33CADA	132.6	-.0	920.	12-21-73	12.5	3.	1.	360.	1.6	< .01	< .01	8.3	815.	36.
35 46E 5AARR	97.5	60.4	961.	10-23-74	15.0	3.	1.	368.	2.1	< .12	< .01	9.4	834.	82.
35 46E 7ADRR	40.5	-.0	995.	1-18-74	8.0	18.	16.	1025.	9.4	< .01	< .01	3.0	1008.	36.
35 46E 14CRCD	16.8	5.2	1007.	1-17-74	8.0	63.	122.	228.	10.6	< .01	< .01	23.2	556.	0.
35 46E 15CAAA	39.6	33.5	1002.	1-17-74	9.0	85.	129.	305.	19.0	< .01	< .01	24.1	649.	0.
35 46E 16ADCC	46.3	15.2	1003.	2-26-76		133.	211.	988.	13.2	1.92	.18	8.7	778.	0.
35 46F 17DADC	25.9	16.8	977.	1-17-74	7.5	88.	160.	370.	14.0	< .01	< .03	17.6	762.	0.
35 46E 19ADRA	62.5	11.7	978.	8-12-75		93.	133.	447.	8.2	< .01	< .01	8.3	606.	0.
35 46F 19RRAC	24.4	8.4	962.	1-14-74	8.5	141.	336.	728.	23.7	< .01	< .42	26.3	1004.	0.
35 46F 30RCCC	51.8	28.7	992.	5-28-75	12.5	169.	224.	966.	13.6	.05	.06	10.1	967.	0.
35 48E 5DDDA	53.3	7.0	1049.	4-21-76	11.0	8.	4.	640.	2.9	.23	< .01	7.1	1730.	0.
35 48E 23AADD	33.5	7.5	1020.	4-21-76	10.0	219.	140.	585.	12.6	5.30	.06	12.5	787.	0.
35 49E 3RADB	50.3	43.9	1082.	7- 1-76	9.5	210.	166.	970.	10.6	18.10	.53	8.1	1016.	0.
35 49E 11DADC	15.5	2.0	1056.	12- 3-75	8.5	128.	70.	210.	9.4	.19	.03	17.6	357.	0.
35 49E 12CAAA	30.5	9.7	1035.	7-14-76	8.5	145.	87.	192.	6.2	2.14	.05	11.8	476.	0.
35 49E 13DADA	44.5	34.5	1046.	7-14-76	10.0	83.	47.	367.	5.3	1.60	.11	10.8	553.	0.
35 49E 19RACA	32.0	24.6	1030.	7-13-76	12.0	18.	8.	484.	3.8	.10	.02	10.0	795.	0.
35 49E 23DADC	34.4	11.6	1032.	11-12-75	8.0	64.	47.	15.	3.2	.01	.01	14.1	429.	0.
35 49E 30CCDC	50.3	18.7	1069.	4-21-76	11.0	195.	109.	1900.	8.5	1.29	.40	10.9	947.	0.
35 49E 35DCAD	36.6	10.9	1030.	11-12-75	10.5	150.	83.	464.	9.1	.01	.02	10.2	742.	0.
35 50E 3BARD	310.0	14.8	997.	6-23-76	10.5	147.	73.	180.	6.5	3.48	.28	10.5	301.	0.
35 50E 8RRRA	30.5	5.2	1017.	12- 4-75	8.5	100.	67.	69.	4.8	.60	.02	12.9	512.	0.
35 50E 12AA	263.7	16.6	975.	6-23-76	13.0	126.	42.	210.	7.2	2.78	.06	9.3	477.	0.
35 50E 15RCAB	22.9	14.4	999.	12- 2-75	9.5	83.	63.	51.	5.6	.08	.07	14.1	405.	0.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORA-TORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
25 45E 17CAPD	4- 6-76	384.	3.5	.1	.05	1289.	2.6	1822.	7.51	USGS	KNOBLOCH COAL
25 46E 5AAC	10-24-74	714.	5.3	1.0	.02	1517.	6.1	2116.	8.40	USGS	SAWYER COAL
25 46E 34BCCB	12-21-73	1370.	4.8	.3	1.97	2844.	41.1	3954.	8.38	USGS	KNOBLOCH OVERBUR
25 49E 26AACA	6-29-76	856.	4.5	< .1	.03	1779.	5.9	2420.	7.53	USGS	KNOBLOCH COAL
25 50E 4DDAA	7- 8-76	394.	4.2	< .1	< .02	989.	5.4	1336.	7.70	USGS	UNKNOWN
25 50E 8ADAD	7- 7-76	744.	4.8	.2	.22	1538.	26.9	2282.	7.94	USGS	KNOBLOCH COAL
25 50E 17BDAA	6-28-76	617.	4.0	< .1	.32	1214.	1.6	1694.	7.40	USGS	KNOBLOCH COAL
25 50E 34CCBD	7- 8-76	402.	11.8	.2	.34	894.	1.7	1287.	7.70	USGS	RASAL TONGUE R.
35 44E 11BCAA	5-20-75	1.	68.0	4.1	.11	943.	53.4	1827.	7.99	USGS	TULLOCK
35 44E 13DBBA	12-19-73	1.	177.0	5.0	< .02	1385.	60.4	2251.	8.79	USGS	DEEP SANDSTONE
35 44E 33BDAA	6- 5-75	0.	34.0	1.5	.40	790.	53.4	1318.	8.19	USGS	TULLOCK
35 45E 3BADD	5-27-75	1853.	17.2	.9	8.81	3474.	14.5	4600.	7.81	USGS	KNOBLOCH COAL
35 45E 5DBBC	5-28-75	424.	8.2	.5	.38	1097.	4.6	1620.	7.69	USGS	UNKNOWN
35 45E 9DDAD	6-25-75	1226.	10.6	.8	3.84	2393.	13.6	3260.	7.49	USGS	MELL CR.
35 45E 10BAC	10- 8-74	600.	6.4	.9	.23	1450.	7.8	2134.	8.16	USGS	UNKNOWN
35 45E 13DCBC	1-14-74	1079.	15.0	.7	1.31	2520.	25.1	3460.	8.26	USGS	KNOBLOCH COAL
35 45E 15DDDA	12-17-73	566.	12.2	1.0	1.11	1355.	33.1	2010.	8.12	USGS	SUB-KNOBLOCK
35 45E 19DDBD	8-13-75	4.	66.0	3.1	.11	836.	53.7	1388.	7.92	USGS	UNKNOWN
35 45E 19DDDD	12-19-73	1.	65.0	2.9	.02	831.	43.3	1383.	8.60	USGS	UNKNOWN
35 45E 22BAAA	1-12-74	660.	4.8	.6	.68	1475.	6.5	2047.	8.37	USGS	SUB-KNOBLOCH
35 45E 22BBBA	12-20-73	423.	5.1	.7	16.26	1063.	3.7	1552.	7.84	USGS	SUB-KNOBLOCH
35 45E 23DADA	1-21-74	1.	32.0	2.2	.05	727.	38.7	1160.	8.41	USGS	SUB-KNOBLOCH
35 45E 24ACDA	5-28-75	1519.	8.6	.5	1.13	2709.	7.9	3444.	7.84	USGS	KNOBLOCH COAL
35 45E 31DCDA	8-13-75	2096.	14.7	1.4	4.20	3455.	10.3	4401.	7.46	USGS	SUB-KNOBLOCH
35 45E 32DDAC	2-26-76	1.	69.1	3.3	.09	841.	53.0	1390.	8.15	USGS	TULLOCK
35 45E 33BCBB	12-18-73	1.	66.0	3.3	.09	848.	53.6	1379.	8.54	USGS	DEEP SANDSTONE
35 45E 33CBDA	12-21-73	5.	34.5	3.3	.09	853.	49.1	1471.	8.54	USGS	DEEP SANDSTONE
35 46E 5AABB	10-23-74	0.	7.9	2.3	.02	886.	52.5	1433.	9.11	USGS	TULLOCK
35 46E 7ADBA	1-10-74	1414.	8.2	.5	2.24	3028.	42.2	4210.	8.54	USGS	KNOBLOCH COAL
35 46E 14CBCD	1-17-74	476.	6.1	.4	1.13	1404.	3.9	1937.	8.01	USGS	ALLUV.HOME CREEK
35 46E 15CAAA	1-17-74	816.	6.8	.5	3.84	1696.	4.9	2259.	8.25	USGS	SAWYER COAL
35 46E 16ADCC	2-26-76	2506.	14.3	.5	.42	4340.	12.4	5263.	7.54	USGS	KNOBLOCH COAL
35 46E 17DADC	1-17-74	1044.	6.1	.5	.16	2075.	5.4	2718.	8.12	USGS	KNOBLOCH COAL
35 46E 19ADBA	8-12-75	1218.	6.7	.6	2.44	2215.	7.0	2874.	7.47	USGS	UNKNOWN
35 46E 19BBAC	1-14-74	2452.	10.6	.6	.27	4212.	7.6	4944.	8.11	USGS	KNOBLOCH COAL
35 46E 30BCCC	5-28-75	2554.	16.9	.3	4.97	4434.	11.5	5082.	7.58	USGS	KNOBLOCH COAL
35 48E 5DDDA	4-21-76	D.	13.0	1.9	.10	1528.	46.0	2394.	8.13	USGS	SAWYER DR.
35 48E 23AARD	4-21-76	166R.	8.2	.1	.03	3038.	7.6	3895.	7.67	USGS	KNOBLOCH COAL
35 49E 3BADB	7- 7-76	244R.	9.6	.2	.10	4341.	12.1	5345.	7.60	USGS	SAWYER COAL
35 49E 11BADC	12- 3-75	752.	7.7	.6	1.67	1373.	3.7	1782.	7.87	USGS	SUB-SAWYER
35 49E 12CAAA	7-14-76	712.	3.6	.2	< .02	1394.	3.1	2089.	7.54	USGS	BROADUS OB
35 49E 13DADA	7-14-76	658.	5.1	.2	.35	1490.	8.0	2149.	7.48	USGS	BROADUS OR
35 49E 19BACA	7-13-76	425.	13.9	.4	.04	1350.	24.1	1888.	8.03	USGS	UNKNOWN
35 49E 23DAOC	11-12-75	38.	3.9	.5	.72	397.	.3	634.	7.92	USGS	BROADUS COAL
35 49E 30CCOC	4-21-76	218R.	17.8	.4	1.13	3988.	14.4	5880.	7.62	USGS	BROADUS COAL
35 49E 35DCAD	11-12-75	1109.	7.2	.1	4.43	2210.	7.6	2934.	7.82	USGS	BROADUS DR.
35 50E 3BARD	6-23-76	737.	7.3	.2	.08	1358.	3.0	1034.	7.71	USGS	MELLCR.
35 50E AARRA	12- 4-75	252.	3.2	.2	.09	762.	1.3	1155.	7.68	USGS	BROADUS COAL
35 50E 12AA	6-23-76	554.	7.9	< .1	.52	1194.	4.1	1704.	7.61	USGS	MELLCR.
35 50E 15RCRB	12- 2-75	233.	7.6	.4	1.09	658.	1.0	930.	7.82	USGS	ALLUV.ASH CREEK

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
35 50E 24DD	45.7	21.3	1000.	6-24-76	13.0	152.	59.	210.	6.9	1.20	.08	10.8	373.	0.
35 50E 30RADD	301.1	6.0	±015.	6-23-76	11.0	184.	94.	452.	8.5	4.03	.19	6.0	335.	0.
4S 44E 5AAAC	12.2		905.	6- 5-75	10.5	56.	68.	293.	12.4	.50	.06	11.6	449.	0.
4S 45E 2CDDA	24.4	17.1	936.	11-23-76	9.0	105.	125.	331.	12.4	.21	.03	21.1	644.	0.
4S 45E 4DACA	76.2	-.0	919.	1-12-74	13.0	3.	1.	270.	1.4	.02	< .01	7.7	656.	2.
4S 45E 4DADA	15.2	3.3	919.	1-12-74	10.0	90.	135.	357.	23.4	.04	.27	29.5	608.	0.
4S 45E 9CAAD	243.8	-.0	928.	5-27-75	16.0	3.	1.	584.	2.9	< .01	< .01	8.8	1387.	0.
4S 45E 9DDRA	243.8	-.0	924.	5-29-75	15.0	4.	1.	650.	3.1	< .01	< .01	8.8	1431.	0.
4S 45E 15CCDD	213.4	-1.9	930.	12-19-73	14.0	3.	1.	395.	1.8	< .01	< .01	9.0	966.	0.
4S 45E 15DBRD	137.2	-.0	936.	5-29-75	11.5	3.	1.	610.	2.6	< .01	< .01	9.3	1372.	0.
4S 45E 19DADC	99.4	79.2	1003.	6-26-75	13.0	9.	6.	1028.	5.7	< .01	< .01	7.6	2498.	0.
4S 45E 20CCAA	56.4	39.6	989.	12-19-73	10.0	91.	159.	323.	8.4	< .01	< .01	12.7	915.	0.
4S 45E 22ADCC	134.1	-.0	932.	1-29-74	15.4	3.	1.	381.	1.8	< .01	< .01	8.3	881.	0.
4S 45E 23CCCA	138.4	-.0	939.	1-14-74	14.5	2.	1.	255.	1.2	< .02	< .01	9.1	649.	0.
4S 45E 27DAC	109.7	-.0	938.	12-17-73	11.0	3.	1.	240.	1.2	< .01	< .01	8.3	624.	0.
4S 45E 27DADC	18.0	6.7	942.	11-23-76	9.5	88.	108.	418.	19.6	2.85	.26	25.2	671.	0.
4S 45E 28AADA	39.3	18.3	963.	6-26-75	12.0	183.	144.	638.	11.5	.01	.30	12.8	910.	0.
4S 46E RCACC	33.5	18.3	989.	6- 6-75	11.0	85.	165.	982.	12.0	.16	.03	10.5	718.	0.
4S 46E 9RACA	94.5	57.6	1003.	11-22-76	12.0	4.	2.	424.	2.4	.48	< .01	7.0	1141.	0.
4S 46E 31CCFC	73.2		969.	1-16-74	8.0	35.	18.	469.	6.2	< .01	< .01	12.2	488.	0.
4S 46E 31DDAC	5.5	3.0	979.	6-27-75	8.0	197.	253.	534.	20.8	.01	.17	18.3	980.	0.
4S 47E 12CARD	44.2	9.9	1103.	6-24-76	10.5	136.	167.	360.	10.0	.97	.03	9.0	658.	0.
4S 47E 18BACD	17.4	3.3	1073.	6-23-76	8.5	143.	144.	180.	10.0	.05	.16	18.9	581.	0.
4S 48E 24AADA	53.3	5.7	1082.	6-24-76	10.0	252.	164.	960.	14.0	.06	.24	8.7	740.	0.
4S 48E 34DDRA	45.7	3.3	1133.	6-24-76	8.5	149.	148.	120.	4.9	.35	.02	8.2	545.	0.
4S 49E RAA	18.3	4.9	1055.	11- 6-75	11.0	18.	8.	33.	6.3	.85	.08	10.9	20.	0.
4S 49E 14AARA	56.4	9.2	1019.	11- 3-75	10.0	129.	76.	272.	8.9	.01	.12	10.6	493.	0.
4S 49E 14ACRD	37.2	9.1	1025.	11- 4-75	10.5	198.	94.	262.	9.3	.02	.78	10.2	473.	0.
4S 49E 15ADDD	45.7	26.4	1030.	11- 4-75	10.5	23.	10.	584.	3.3	.01	.01	6.7	288.	0.
4S 49E 16CC	11.6	5.3	1044.	11- 4-75	9.0	132.	118.	548.	8.7	.66	.21	10.5	932.	0.
4S 49E 23ACAC	36.6	19.4	1030.	11- 4-75	10.5	145.	115.	600.	8.5	.01	.04	9.5	445.	0.
4S 49E 25DARB	106.4	53.6	1049.	11-12-75	11.5	76.	31.	442.	4.4	.01	.08	9.6	411.	0.
4S 49E 31CCCC	85.3	76.9	1132.	11- 4-75	12.0	311.	296.	548.	13.7	.04	.27	10.1	449.	0.
4S 50E 12ACCA	48.8	14.7	976.	11-14-75	11.5	96.	45.	73.	4.3	.01	.09	10.4	355.	0.
4S 52E 18RADC	310.9	3.0	920.	7-29-76	15.0	1.	0.	197.	.7	.01	< .01	9.2	316.	25.
5S 41E 31CBAC	24.4	4.8	1106.	3- 3-76	6.7	69.	92.	118.	6.8	< .01	< .01	13.9	610.	0.
5S 42E 16DDR	24.4	9.7	1024.	3- 2-76	9.5	61.	67.	128.	8.7	< .01	< .04	24.8	574.	0.
5S 42E 18DCD	24.4	11.6	1024.	3- 1-76	10.0	82.	106.	171.	10.2	< .01	< .01	23.5	603.	0.
5S 42E 20ADDR	33.5	9.6	1024.	3- 2-76	7.0	5.	0.	546.	2.8	< .01	< .01	7.6	831.	4.
5S 42E 22DBRC	253.0	-7.0	978.	3- 1-76	16.5	2.	0.	243.	1.4	< .05	< .01	9.7	531.	0.
5S 42E 34ABRA	259.1	-.0	975.	11-11-75	15.5	2.	0.	250.	1.3	.04	.01	10.1	520.	13.
5S 45E 3ARCD	27.4	4.7	948.	11-24-76	11.0	3.	2.	388.	2.7	.07	.01	6.6	419.	7.
5S 45E 3ACRR	198.1		950.	12-18-73	7.0	7.	3.	383.	3.0	.09	< .01	8.0	420.	0.
5S 45E 4RBDD	76.2		987.	1-13-74	13.0	2.	2.	253.	1.2	< .01	< .01	10.1	632.	5.
5S 45E 11RBAC	307.2	-.0	951.	6-26-75	18.0	3.	0.	686.	3.4	< .01	< .01	9.0	1547.	0.
5S 45E 11CDCD			954.	6-25-75	12.0	10.	3.	518.	3.2	< .01	< .01	8.2	302.	0.
5S 45E 14AAAD	365.8	-.0	962.	1-29-74	16.5	6.	1.	738.	3.4	< .03	< .01	9.6	1664.	22.
5S 45E 15DAAA	378.9	-.0	959.	12-18-73	13.5	3.	1.	638.	2.8	< .01	< .01	10.2	1347.	53.
5S 45E 26RARB	12.2		960.	12-19-73	10.5	127.	174.	321.	16.6	< .01	.76	19.3	649.	0.
5S 45E 27BDDB	76.8	38.1	997.	6-26-75	13.0	2.	1.	388.	2.2	.01	< .01	7.7	963.	0.

NOTE
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Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH (LABORA-TORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
35 S0E 24DD	6-24-76	759.	7.4	.1	.11	1390.	3.7	1906.	7.43	USGS	BASAL TONGUE R.
35 S0E 30BADD	6-23-76	1517.	9.7	< .1	1.65	2442.	6.8	3139.	7.58	USGS	HELL CR
4S 4SE 5AAAC	6- 5-75	625.	8.5	1.8	.45	1297.	6.2	1892.	7.49	USGS	ALLUV. TONGUE R.
4S 4SE 2CDDB	11-23-76	928.	9.5	.5	.52	1849.	5.2	2500.	7.67	USGS	KNOBLOCH C. UB
4S 4SE 4DDCA	1-12-74	4.	24.6	2.8	< .02	638.	37.2	1050.	8.32	USGS	OEEP SANDSTONE
4S 4SE 4DDDB	1-12-74	1028.	9.1	.8	.14	1972.	5.6	2588.	8.22	USGS	ALLUV.OTTER CR.
4S 4SE 9CAAD	5-27-75	1.	110.0	5.5	.05	1398.	74.6	2222.	8.18	USGS	TULLOCK
4S 4SE 9DDBA	5-29-75	3.	163.0	1.6	.05	1538.	73.6	2404.	8.06	USGS	TULLOCK
4S 4SE 15CCDD	12-19-73	6.	65.0	2.9	< .02	959.	45.5	1572.	8.09	USGS	DEEP SANDSTONE
4S 4SE 15DADD	5-29-75	4.	149.6	1.6	.05	1455.	74.3	2340.	8.06	USGS	TULLOCK
4S 4SE 19DADC	6-26-75	200.	10.9	1.2	1.42	2498.	64.1	3681.	8.02	USGS	KNOBLOCH C. UB
4S 4SE 20CCAD	12-19-73	780.	10.6	.6	.63	1836.	4.7	2544.	7.86	USGS	SUB-KNOBLOCK
4S 4SE 22DCC	1-29-74	1.	77.0	2.9	< .02	909.	45.8	1528.	8.25	USGS	DEEP SANDSTONE
4S 4SE 23CCCB	1-14-74	1.	23.8	2.0	.05	613.	35.3	1009.	8.29	USGS	OEEP SANDSTONE
4S 4SE 27DAC	12-17-73	0.	19.9	1.8	< .02	582.	31.5	968.	8.08	USGS	DEEP SANDSTONE
4S 4SE 27DDC	11-23-76	936.	16.5	.6	1.27	1945.	7.1	2743.	7.61	USGS	ALLUV. OTTER CR
4S 4SE 28ADDA	6-26-75	1606.	17.7	.4	4.52	3066.	8.6	3911.	6.98	USGS	KNOBLOCH C. UB
4S 4SE 8CBCC	6- 6-75	2176.	6.6	1.3	6.51	3718.	13.1	4320.	7.71	USGS	KNOBLOCH OB.
4S 4SE 9ABCB	11-23-76	2.	11.5	1.8	< .02	1015.	46.8	1596.	8.12	USGS	KNOBLOCH COAL
4S 4SE 31CCCC	1-14-74	721.	8.6	.6	1.63	1511.	16.2	2268.	7.92	USGS	SUB-KNOBLOCK
4S 4SE 31DDBC	6-27-75	1847.	18.7	.6	3.89	3336.	5.9	3976.	7.48	USGS	ALLUV.TENMILE CR
4S 4SE 12CABA	6-24-76	1246.	7.0	.6	.84	2260.	4.9	2910.	7.68	USGS	PAWNEE COAL+OB
4S 4SE 14BACD	6-23-76	832.	7.2	.4	.23	1622.	2.5	2169.	7.83	USGS	ALLUV.PUMPKIN CR
4S 4SE 24AADA	6-24-76	2737.	13.6	.2	.81	4514.	11.6	5342.	7.68	USGS	KNOBLOCH OB
4S 4SE 34DDDA	6-24-76	784.	5.1	.4	.12	1488.	1.7	1958.	7.26	USGS	PAWNEE OB(+C)?
4S 4SE 4AA	11- 3-75	131.	2.2	.1	.02	220.	1.6	331.	5.24	USGS	ALLUV.WISER CR.
4S 4SE 14AABA	11- 3-75	794.	5.4	.2	.54	1539.	4.7	2072.	7.80	USGS	BROADUS COAL
4S 4SE 14ACBD	11- 4-75	1039.	4.1	.3	.38	1851.	3.8	2302.	7.78	USGS	LOCAL COAL
4S 4SE 15ADDD	11- 4-75	1072.	12.0	.2	2.19	1854.	25.9	2592.	7.96	USGS	LOCAL COAL
4S 4SE 1BCC	11- 6-75	1201.	16.1	.1	.79	2494.	8.4	3290.	7.30	USGS	ALLUV.TWO TREE CR.
4S 4SE 23ACAC	11- 4-75	1719.	13.1	.1	3.03	2832.	9.0	3597.	7.61	USGS	BROADUS OB.
4S 4SE 25DABB	11-12-75	931.	7.0	.2	2.31	1705.	10.8	2392.	7.77	USGS	LERO
4S 4SE 31CCCC	11- 4-75	2719.	11.4	.2	1.36	4132.	5.3	4486.	7.53	USGS	SAWYER COAL
4S 5SE 10ACCC	11-14-75	277.	5.3	.2	.48	686.	1.5	947.	7.65	USGS	SUB-BROADUS
4S 5E 14ADDC	7-29-76	115.	7.1	.3	< .02	510.	43.0	849.	9.07	USGS	FOX MILLS
5S 41E 31CBAC	3- 3-76	258.	3.4	.6	.34	841.	2.3	1263.	7.77	USGS	WALL COAL
5S 42E 16DDB	3- 2-76	237.	3.7	1.2	.11	813.	2.7	1229.	7.55	USGS	BREWSTER-ARN.C.
5S 42E 18DCD	3- 1-76	530.	3.5	.8	.88	1224.	2.9	1706.	7.80	USGS	BREWSTER-ARN.C.
5S 42E 20ADDB	3- 2-76	493.	6.7	6.7	.27	1481.	66.6	2208.	8.33	USGS	BREWSTER-ARN.C.
5S 42E 22DBC	3- 1-76	71.	9.0	2.3	.05	600.	43.5	992.	8.28	USGS	DEEP SANDSTONE
5S 42E 34ABBA	11-11-75	79.	4.5	2.5	.02	619.	43.0	1020.	8.53	USGS	DEEP SANDSTONE
5S 45E 3AACD	11-24-76	474.	18.0	.9	< .02	1108.	43.9	1714.	8.45	USGS	L. KNOBLOCH
5S 45E 3ACBA	11-18-75	490.	14.5	1.0	1.28	1108.	29.4	1744.	8.25	USGS	DEEP SANDSTONE
5S 45E 4BADD	1-13-74	2.	22.4	1.5	.09	610.	31.6	1011.	8.30	USGS	SUB-KNOBLOCK
5S 45E 11BAAC	6-26-75	0.	169.0	6.1	.20	1638.	108.5	2637.	7.96	USGS	TULLOCK
5S 45E 11CODD	6-25-75	850.	21.0	.7	2.53	1565.	37.5	2274.	7.36	USGS	ALLUV.OTTER CR
5S 45E 14AAAD	1-29-74	0.	158.0	6.6	< .02	1761.	78.5	2831.	8.39	USGS	DEEP SANDSTONE
5S 45E 15DAAA	12-18-73	3.	145.0	7.0	< .02	1525.	70.4	2500.	8.34	USGS	DEEP SANDSTONE
5S 45E 26BABA	12-19-73	1182.	12.7	.6	.59	2174.	4.3	2752.	7.70	USGS	ALLUV.OTTER CR.
5S 45E 27DDDA	6-26-75	1.	34.0	3.0	.18	913.	56.4	1482.	7.82	USGS	KNOBLOCH C+UB

*NOTE=
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
35 45E 2BABRA	76.2	49.7	1013.	6-25-75	12.0	4.	2.	460.	4.0	.04	< .01	3.0	281.	442.
35 45E 35BARA	64.0	9.1	971.	5-22-75	11.5	3.	0.	210.	1.5	< .01	.01	7.7	538.	0.
35 46E 4DACA	21.3	13.7	1006.	11-23-76	9.5	94.	134.	270.	10.5	.44	.03	19.2	613.	0.
35 46E 4DACA	21.3	13.7	1006.	6-27-75	11.5	91.	129.	267.	8.6	< .01	.16	20.6	605.	0.
35 46E 4DDAB	24.4	12.5	1009.	11-23-76	8.5	105.	149.	240.	10.8	.06	< .01	20.0	549.	0.
35 46E 20CDAB	5.5	.3	994.	1-14-74	8.0	127.	238.	470.	47.9	< .01	< .01	20.2	986.	0.
35 46E 21DDAA	9.1	6.1	1018.	1-18-74	8.5	123.	144.	250.	13.0	< .01	< .01	22.3	649.	0.
35 46E 24BCCB	9.1		1052.	1-18-74	8.5	99.	163.	296.	12.4	< .01	< .01	16.7	723.	0.
35 49E 32ADCD	67.1	36.2	1064.	7-27-76	11.5	53.	29.	800.	6.8	.22	.02	7.6	483.	0.
35 51E 7CDAC	268.2	19.6	951.	7-28-76	12.0	168.	86.	650.	5.9	.40	.09	9.6	832.	0.
35 39E 8DBRC	30.5	26.5	1181.	6-17-75	10.5	61.	76.	69.	10.4	.13	.12	29.1	533.	0.
35 39E 15DDRC	12.2	11.9	1250.	6-26-75	11.5	46.	68.	331.	5.3	< .01	.02	9.6	702.	0.
35 39E 17ADRC	18.3	17.1	1189.	6-17-75	10.5	58.	91.	40.	7.9	< .01	.04	17.5	513.	0.
35 39E 17CDAC	30.5	27.4	1187.	6-17-75	13.5	25.	17.	186.	6.1	< .01	.08	14.7	527.	0.
35 41E 23CCCC	91.4		1042.	7-10-75	9.0	5.	9.	490.	6.6	.10	.01	3.9	1337.	0.
35 41E 32CADA			1058.	7- 3-75	13.0	38.	104.	146.	11.2	.01	< .01	15.2	534.	0.
35 42E 1DDC 1	143.3	-19.7	951.	6-19-75	16.5	3.	3.	500.	2.6	< .01	.01	8.2	773.	0.
35 42E 1DDC 2	75.0		957.	6-19-75	13.5	69.	49.	42.	5.9	.61	.03	14.7	398.	0.
35 42E 13HAR	76.2	-.0	957.	3- 6-74	9.8	3.	2.	506.	2.4	.21	< .01	6.8	1273.	10.
35 42E 13CAA	88.4	-3.2	953.	3- 6-74	10.5	1.	0.	509.	2.0	< .01	< .01	7.1	1060.	70.
35 42E 14DCA	102.1	-3.2	957.	3- 6-74	9.4	2.	0.	587.	2.2	< .01	< .01	7.0	1159.	14.
35 42E 16ACDD	29.3	13.7	1009.	11-10-76	10.5	78.	104.	256.	11.8	.07	.01	15.2	628.	0.
35 42E 23HCA	106.7	-.0	958.	3- 6-74	10.5	2.	1.	537.	2.3	< .01	< .01	6.8	1402.	4.
35 42E 23HDR	48.8	-3.7	959.	3- 6-74	10.5	3.	0.	540.	2.4	< .01	< .01	6.6	1382.	2.
35 42E 23CAR	173.7	-20.0	963.	3-17-74	11.5	2.	0.	398.	1.7	.09	< .01	7.6	1011.	0.
35 42E 27ABR	96.0	-4.1	962.	3- 6-74	10.8	2.	1.	645.	2.7	< .01	< .01	7.3	1686.	0.
35 42E 29CAA	137.2	-2.9	969.	3- 1-74	10.0	1.	1.	505.	2.1	< .01	< .01	7.1	1291.	5.
35 42E 32ABA	213.4	-.0	975.	3- 1-74	14.0	2.	0.	361.	1.7	< .01	< .01	8.2	947.	0.
35 42E 32CBA	121.9	-2.4	975.	3- 2-74	7.5	4.	0.	653.	3.0	.02	< .01	7.1	1669.	0.
35 43E 7DCC	160.0	-16.7	963.	3- 2-74	6.0	3.	1.	528.	2.9	< .01	< .01	7.8	1362.	0.
35 43E 18RAR	146.3	-19.2	954.	3- 2-74	12.4	2.	0.	425.	2.1	< .01	< .01	7.8	1094.	0.
35 48E 9BRDA	36.6	16.7	1234.	7-20-76	13.0	170.	114.	84.	5.7	.04	.12	11.5	752.	0.
35 49E 30AACB		94.5	1079.	7-20-76	13.5	12.	5.	506.	3.8	.01	.01	8.1	561.	0.
35 51E 30CCCC	175.6	45.7	1021.	8- 3-76	13.0	3.	1.	250.	1.6	.05	.01	7.5	554.	0.
35 38E 24DBD 1	18.3	9.1	1329.	7-17-74	10.4	96.	89.	20.	4.5	.04	.18	20.1	567.	0.
35 39E 9CRDB	36.6	12.2	1265.	7-30-74	8.0	54.	94.	39.	6.7	< .01	.03	14.3	462.	0.
35 39E 16ACD	18.3	4.3	1271.	7-23-74	8.0	75.	93.	20.	9.1	< .01	.01	13.6	607.	0.
35 39E 20DAAC	48.8	2.7	1298.	6-20-75	14.5	8.	8.	344.	3.8	< .01	< .01	7.4	678.	0.
35 39E 21ADA		7.2	1286.	7-11-74	11.5	95.	102.	39.	6.4	< .01	.05	13.2	493.	0.
35 39E 21CDA	30.5	4.6	1294.	7-19-74	8.0	78.	81.	65.	8.6	.04	.02	14.1	517.	0.
35 39E 22BCD	12.8	10.7	1292.	7-15-74	11.0	92.	100.	34.	5.5	< .01	.09	12.7	591.	0.
35 39E 23ACD	46.9	18.3	1283.	9-15-72		100.	212.	244.	9.0	.04	.01	32.1	468.	0.
35 39E 23ADCA	36.6	15.2	1285.	9-15-72		117.	140.	890.	15.0	.02	.01	16.3	488.	0.
35 39E 27CDC	106.7	45.7	1247.	7-23-74	12.0	2.	2.	372.	2.8	< .01	< .01	8.4	725.	20.
35 39E 31ACA	11.9	9.1	1347.	7-17-74	9.0	101.	94.	23.	2.9	.02	.02	13.2	483.	0.
35 39E 35DAB	24.0	22.3	1207.	7-16-74	10.0	35.	36.	40.	5.7	.05	.02	18.4	195.	0.
35 39E 36CDDC	22.9	15.2	1192.	9-15-72		37.	41.	43.	6.9	.02	< .01	51.3	197.	5.
35 40E 5DDC	41.8	27.4	1253.	7-16-74	10.5	11.	6.	324.	4.8	.05	< .01	8.1	536.	0.
35 40E 15DCBD	8.8	2.5	1152.	7-17-75	10.5	84.	133.	61.	10.5	.01	.01	17.1	610.	0.
35 40E 27CDAD	4.0	2.4	1140.	7- 9-75	11.5	65.	52.	32.	14.0	.01	.01	20.3	307.	0.

NOTE
INDICATED CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (MG/L) EXCEPT AS NOTED.

Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY	COLLECTING AGENCY	CONTRIBUTING AQUIFER
5S 45E 28RBRA	6-25-75	4.	40.0	1.7	.20	1099.	48.0	1963.	10.14	USGS	KNOBLOCH C+UB
5S 45E 35BAAA	S-22-55	1.	15.5	1.5	.23	505.	34.4	877.	7.74	USGS	SUBKNOBLOCH
5S 46E 4DACA	11-23-76	R44.	R.5	.5	.23	1683.	4.2	2388.	7,60	USGS	KNOBLOCH C.
5S 46E 4DACA	6-27-75	R10.	4.6	.5	5.26	1634.	4.2	2220.	7.53	USGS	KNOBLOCH C.
5S 46E 4DDAB	11-23-76	901.	R.0	.5	.12	1704.	3.5	2275.	7.75	USGS	KNOBLOCH C.
5S 46E 20CDAB	1-14-74	1542.	10.1	.5	.10	2941.	5.7	3641.	7.87	USGS	KNOBLOCH OA.
5S 46E 21DDAA	1-18-74	R96.	7.1	.5	.07	1775.	3.6	2300.	7.92	USGS	AL.FIFTEENMI.CR.
5S 46E 24RCCB	1-18-74	94R.	6.9	.5	.20	1888.	4.1	2360.	8.02	USGS	AL.FIFTEENMI.CR.
5S 49E 32ADCD	7-27-76	1523.	R.0	.3	3.34	2667.	22.1	3730.	7.63	USGS	BASAL TONGUE R
5S 51E 7CDAC	7-28-76	1462.	5.6	.2	2.35	2798.	10.2	3841.	7.63	USGS	HELL CR
6S 39E 8DARC	6-17-75	183.	1.1	.8	.36	693.	1.4	1062.	7.89	USGS	ALLUV.ROSEBUD CR
6S 39E 15DDRC	6-26-75	509.	3.3	.8	1.11	1319.	7.3	1959.	7.39	USGS	CANYON CLINKER
6S 39E 17ADRC	6-17-75	181.	2.5	.8	.43	651.	.8	1025.	7.42	USGS	ALLUV. ROSEBUD C
6S 39E 17CDAC	6-17-75	10R.	1.0	.8	1.24	619.	7.0	1005.	7.38	USGS	ALLUV.ROSEBUD CR
6S 41E 23CCCC	7-10-75	1.	7.0	11.6	.15	1192.	29.9	1972.	8.07	USGS	BREWSTER-ARN.C.
6S 41E 32CADA	7- 9-75	36R.	4.7	.6	1.65	952.	2.8	1414.	7.96	USGS	SUB-WALL
6S 42E 10DC 1	6-19-75	461.	3.4	3.1	1.08	1365.	52.1	2120.	7.94	USGS	BASAL TONGUE R.
6S 42E 10DC 2	6-19-75	13R.	3.7	.8	.27	520.	.9	834.	7.35	USGS	KNOBLOCK COAL
6S 42E 13BAA	3- 6-74	2R.	4.0	9.1	.07	1197.	55.1	1895.	8.34	USGS	KNOBLOCK COAL
6S 42E 13CAA	3- 6-74	99.	3.8	6.7	< .02	1217.	106.6	1938.	8.93	USGS	DEEP SANDSTONE
6S 42E 14DCA	3- 6-74	106.	4.5	7.4	.02	1220.	95.0	1923.	8.49	USGS	DEEP SANDSTONE
6S 42E 16ACDD	11-10-76	60R.	15.0	1.7	.43	1399.	4.5	2095.	7.78	USGS	BREW-ARNOLD OB
6S 42E 23ACA	3- 6-74	0.	4.3	9.1	.05	1256.	85.5	2017.	8.33	USGS	DEEP SANDSTONE
6S 42E 23BDA	3- 6-74	19.	4.6	9.5	.02	1266.	84.5	2010.	8.31	USGS	DEEP SANDSTONE
6S 42E 23CAB	3- 6-74	0.	5.0	9.3	.09	907.	69.6	1467.	8.27	USGS	DEEP SANDSTONE
6S 42E 27AAB	3- 6-74	1.	4.6	7.0	< .02	1500.	98.6	2342.	8.27	USGS	DEEP SANDSTONE
6S 42E 29CAA	3- 1-74	1.	6.8	10.4	< .02	1174.	90.0	1878.	8.32	USGS	DEEP SANDSTONE
6S 42E 32AHA	3- 1-74	1.	5.1	5.2	.05	850.	64.6	1372.	8.22	USGS	DEEP SANDSTONE
6S 42E 32CBA	3- 2-74	1.	5.2	9.1	.05	1503.	83.2	2357.	8.29	USGS	DEEP SANDSTONE
6S 43E 7DCC	3- 2-74	1.	6.3	6.0	< .02	1225.	74.7	1902.	8.20	USGS	DEEP SANDSTONE
6S 43E 18BAA	3- 2-74	1.	4.3	6.0	.14	986.	73.6	1578.	8.29	USGS	DEEP SANDSTONE
6S 48E 9BADA	7-20-76	388.	10.1	.2	17.62	1171.	1.2	1782.	7.51	USGS	CANYON COAL
6S 48E 30AACB	7-20-76	659.	6.1	.5	< .02	1476.	31.6	2179.	7.76	USGS	UNKNOWN
6S 51E 30CCCC	A- 5-76	70.	18.2	1.6	.03	625.	31.0	1013.	8.23	USGS	UNKNOWN
7S 38E 24DBD 1	7-17-74	182.	2.0	.7	< .02	693.	.4	1064.	7.39	USGS	AND. CLINKER
7S 39E 9CADB	7-30-74	286.	4.2	.4	.09	644.	.7	1009.	7.93	USGS	CANYON COAL
7S 39E 16ACD	7-23-74	99.	6.1	.6	1.15	616.	.4	1029.	8.04	USGS	ALLUV.ROSEBUD CR
7S 39E 20DAAC	6-20-75	221.	1.4	.4	1.76	928.	21.0	1462.	7.49	USGS	DIET7 COAL
7S 39E 21ADA	7-11-74	318.	4.5	.9	2.71	824.	.7	1225.	7.40	USGS	ALLUV.ROSEBUD CR
7S 39E 21CDA	7-19-74	236.	4.5	.5	.18	742.	1.2	1130.	7.60	USGS	ANDERSON COAL
7S 39E 22ACD	7-15-74	231.	2.8	.8	.61	770.	.6	1172.	7.37	USGS	ALLUV.ROSEBUD CR
7S 39E 23ACD	9-15-72	1223.	4.1	< .1	6.84	2065.	3.2	2520.	7.91	MBMG	DIET7 COAL
7S 39E 23ADCA	9-15-72	2276.	7.4	.6	6.84	3709.	13.1	4520.	8.08	MBMG	UNKNOWN
7S 39E 27CDC	7-23-74	167.		3.2	.84	935.	46.6	1501.	8.57	USGS	UNKNOWN
7S 39E 31ACA	7-17-74	286.	.4	.5	.34	759.	.4	1149.	7.53	USGS	AND. CLINKER
7S 39E 35DAB	7-16-74	166.	3.3	1.0	< .02	401.	1.1	569.	7.50	USGS	DIET7 CLINKER
7S 39E 36CDDC	9-15-72	171.	2.5	1.2	1.47	457.	1.1	649.	8.34	MBMG	DIET2 CLINKER
7S 40E 5DDC	7-16-74	302.	3.4	.4	4.97	928.	19.6	1447.	7.76	USGS	CANYON COAL
7S 40E 15QCBD	7-17-75	380.	6.0	.5	.61	992.	1.0	1472.	7.45	USGS	ALLUV.FOURM1.CR.
7S 40E 27CDAD	7- 9-75	189.	5.7	.9	.93	531.	.7	828.	7.41	USGS	ALLUVIUM POST CR

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA (SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
7S 41E 4DCDD			1020.	7- 3-75	11.0	40.	76.	141.	13.2	.02	.01	5.1	358.	0.
7S 41E 19DCAA	18.3	2.7	1047.	7-17-75	9.0	90.	139.	96.	11.5	.01	.01	14.8	605.	0.
7S 41E 22ADCA	13.4	5.5	994.	6-26-75	10.0	71.	72.	137.	7.9	< .01	.01	13.4	361.	0.
7S 41E 27DBBC 1	6.1	1.8	1000.	7-17-75	9.5	32.	44.	350.	9.4	.01	.01	14.5	1074.	0.
7S 41E 27DBBC 2	6.1	3.7	1000.	7-17-75	9.0	55.	144.	845.	13.2	.01	.01	16.6	1557.	0.
7S 42E 6BCAA	79.2		981.	6-24-75	9.0	56.	54.	59.	9.0	< .01	< .01	19.5	347.	0.
7S 42E 6BCDA	6.1	3.7	981.	6-24-75	9.0	109.	56.	54.	3.9	< .01	< .01	12.4	393.	0.
7S 45E 13DCCC	64.6	13.1	1036.	8- 3-76	11.0	3.	1.	492.	2.9	.05	< .01	7.1	1277.	0.
7S 48E 15ACAA	12.2	8.7	1055.	7-21-76	12.5	102.	120.	220.	12.9	.31	.03	21.0	521.	0.
7S 51E 34DADA	253.0	20.4	1116.	7-22-76	9.5	109.	48.	23.	4.8	.10	.05	11.0	371.	0.
8S 39E 11ADA	12.8	2.1	1301.	7-10-74	12.0	109.	184.	100.	5.5	.01	< .01	15.8	615.	0.
8S 39E 12DCDD	5.5		1247.	7-10-74	9.5	127.	117.	73.	6.7	.01	.01	18.9	631.	0.
8S 39E 14DAB	16.8	14.4	1178.	7-11-74	11.5	59.	65.	45.	8.8	< .01	< .01	23.9	176.	0.
8S 39E 12ACA 1	93.0	43.0	1177.	7-10-74	12.5	31.	23.	261.	7.5	< .01	.01	12.0	426.	9.
8S 39E 13ABC	106.1	75.9	1244.	7-29-74	10.0	156.	198.	543.	13.8	< .01	.12	15.4	859.	0.
8S 39E 14CABD		24.1	1161.	10-13-73	12.0	89.	70.	113.	7.5	.05	.04	14.2	507.	0.
8S 40E 11CAA	4.3	1.0	1062.	7-17-74	13.5	85.	57.	36.	8.1	< .01	< .01	21.3	420.	0.
8S 40E 16ABAD	92.4	45.7	1172.	6-18-75	12.0	37.	31.	52.	6.1	< .01	.02	12.4	246.	0.
8S 40E 33ACDA		16.5	1062.	10-11-73	10.5	130.	72.	179.	12.4	.03	.05	13.2	347.	0.
8S 41E 21CAPC	38.2	24.9	1138.	10-17-73	15.0	24.	32.	60.	5.6	< .01	< .01	32.6	215.	0.
8S 41E 24DCAA	17.4	4.9	1213.	11- 9-76	11.5	247.	600.	366.	3.5	1.80	.10	7.3	694.	0.
8S 41E 25CCAA	128.0	118.3	1265.	10-14-73	13.5	29.	14.	1213.	9.1	.02	.03	8.6	990.	0.
8S 42E 15BCCD	47.9	12.2	1198.	11-10-76	9.5	181.	320.	280.	6.6	.16	.04	9.4	700.	0.
8S 42E 26CABA	48.5	27.9	1161.	11-15-73	11.0	108.	96.	720.	12.3	< .01	.10	12.1	1135.	0.
8S 43E 29BDAC	6.1	3.0	1211.	11-15-76	10.0	132.	175.	117.	6.4	.10	.01	10.7	500.	0.
8S 43E 13ACCA	33.5	23.8	1178.	6-19-75	11.0	43.	53.	93.	7.0	< .01	.02	11.6	471.	0.
8S 43E 23DBDA	83.5	5.5	1099.	2-26-74	9.0	217.	329.	790.	8.4	.02	.04	14.6	600.	0.
8S 43E 29DABC	7.3	4.6	1073.	10-26-73	9.0	121.	102.	215.	9.3	.01	< .01		441.	0.
8S 43E 30BBCD	14.3	11.3	1103.	11-15-73	9.5	74.	103.	138.	7.3	< .01	< .01	18.4	317.	0.
8S 44E 24ADC	14.6	11.1	1141.	11-16-73	9.0	34.	24.	387.	7.3	.03	< .01	10.6	589.	26.
8S 44E 15BCC	15.5	3.7	1190.	6- 4-75	9.0	174.	189.	120.	5.9	.13	< .01	9.8	439.	0.
8S 44E 22CCD	57.9	43.9	1251.	6-19-75	11.0	57.	76.	38.	4.2	< .01	< .01	21	381.	0.
8S 44E 35AAFC	9.8	8.2	1224.	6-19-75	10.0	80.	46.	17.	1.7	< .01	< .01	13.5	422.	0.
8S 44E 35ADCC	8.5		1224.	2- 3-74	9.4	79.	48.	20.	1.6	.02	< .01	16.3	422.	0.
8S 45E 4ACAA	7.6		1084.	2-27-74	12.0	177.	295.	593.	17.1	.02	.10	21.1	712.	0.
8S 45E 16DDCB	12.8		1122.	2- 2-74	8.6	357.	410.	733.	19.4	.03	.02	24.8	787.	0.
8S 45E 20BDAB		3.4	1152.	2- 2-74	8.6	225.	282.	368.	11.3	.02	.03	19.9	517.	0.
8S 45E 27BDAD 1	13.7		1133.	1-30-74	8.5	402.	337.	983.	15.9	.03	.02	23.5	565.	0.
8S 45E 33BAAC	15.2	6.7	1149.	2- 1-74	8.0	394.	273.	698.	39.4	.05	1.08	25.2	786.	0.
8S 45E 33BADB	9.1		1149.	1-30-74	9.5	410.	382.	613.	36.8	.06	1.38	31.4	752.	0.
8S 45E 33BBDD	9.1	1.9	1152.	2- 2-74	8.5	148.	294.	464.	7.4	< .01	.46	26.0	106.	0.
8S 45E 34CAAC	6.1	2.1	1146.	1-30-74	7.6	298.	213.	583.	12.2	.03	1.66	20.5	569.	0.
8S 46E 5DDAD	4.9	3.0	1100.	2- 7-74	4.0	114.	193.	379.	33.6	< .01	< .01	16.0	692.	0.
8S 48E 12AACA	173.7	.1	997.	7-22-76	13.5	3.	1.	203.	1.5	.01	< .01	7.1	532.	0.
8S 48E 13BDDD	115.8	-.0	1006.	7-28-76	12.0	3.	1.	218.	1.7	.04	< .01	7.5	549.	0.
8S 50E 25CBD	12.2	4.3	1140.	7-20-76	9.5	272.	199.	60.	10.5	.08	.07	21.0	294.	0.
9S 38E 24CABC 1	4.6	3.1	1183.	10-15-72	7.0	110.	220.	155.	12.0	.02	.07	40.0	580.	0.
9S 38E 24CABC 2	73.2	12.5	1183.	4-26-73		5.	2.	448.	4.1	< .01	< .01	6.8	874.	72.
9S 39E 14BDAD			1115.	10-17-73	14.0	3.	1.	354.	4.0	< .01	< .01	8.8	870.	28.
9S 40E 3ACAB	61.0	8.0	1044.	5- 2-75	12.0	2.	1.	350.	3.2	.01	< .01	9.1	933.	0.
9S 40E 4CDA		29.0	1080.	6-18-75	12.5	217.	341.	506.	29.7	.01	.01	17.3	371.	0.
9S 40E 17ACAC	54.9		1082.	7-14-72	12.0	4.	2.	500.	4.1	4.00	.02	19.3	953.	18.

NOTE
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Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (S.A.R.)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORA-TORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
7S 41E ADCDD	7- 3-75	396.	4.2	.7	1.99	852.	3.0	1271.	7.12	USGS	ALLUV.CANYON CR
7S 41E 19DCAA	7-17-75	486.	11.2	.6	.57	1146.	1.5	1646.	7.40	USGS	WALL COAL&CL.
7S 41E 22ADCA	6-26-75	457.	4.5	.6	2.55	943.	2.7	1363.	7.73	USGS	ALLUV.TONGUE R
7S 41E 27DBAC 1	7-17-75	172.	17.5	1.4	.14	1114.	9.4	1758.	7.61	USGS	WALL COAL
7S 41E 27DBAC 2	7-17-75	1217.	26.5	2.2	1.83	3087.	13.6	3951.	8.09	USGS	WALL COAL
7S 42E 6ACAA	6-26-75	193.	3.2	.5	.68	565.	1.3	975.	7.52	USGS	DEEP SANDSTONE
7S 42E 6ACDB	6-26-75	263.	11.7	.3	1.13	705.	1.9	1071.	6.98	USGS	ALLUV.TONGUE R
7S 45E 13DCCC	8- 3-76	0.	21.4	3.6	.03	1160.	58.6	1871.	8.05	USGS	UNKNOWN
7S 48E 15ACAA	7-21-76	782.	4.6	.7	.13	1520.	3.5	2098.	7.66	USGS	ALLUV.GLOOM CR
7S 51E 34DADA	7-22-76	209.	1.2	.4	1.21	589.	.5	927.	7.61	USGS	UNKNOWN
8S 38E 11ADA	7-10-74	925.	5.8	.3	1.92	1729.	1.2	2200.	7.60	USGS	ALLUV.SPRING CR.
8S 38E 12DCDD	7-10-74	400.	12.6	.9	.36	1067.	1.1	1541.	7.76	USGS	ALLUV.SPRING CR.
8S 39E 1ADAB	7-11-74	348.	4.5	1.0	2.08	643.	1.0	944.	7.88	USGS	AND.-DIETZ CL.
8S 39E 12ACA 1	7-10-74	967.	5.3	2.2	.88	928.	8.7	1419.	8.46	USGS	SUB-DIETZ 2
8S 39E 13ABC	7-29-74	1523.	15.3	.8	13.24	2901.	6.8	3690.	7.44	USGS	AND.-DIETZ COAL
8S 39E 14CBAD	10-13-73	327.	6.5	.3	.34	877.	2.2	1190.	7.88	USGS	UNKNOWN
8S 40E 11CAA	7-17-74	176.	6.8	1.0	.07	598.	.7	919.	7.64	USGS	AL. LEAF ROCK CR
8S 40E 19BBAD	6-18-75	124.	3.5	.6	.36	390.	1.5	704.	6.89	USGS	CANYON COAL
8S 40E 33ACDB	10-11-73	703.	5.7	.3	1.36	1287.	3.1	1610.	7.74	USGS	DIETZ 2 COAL
8S 41E 21CABC	10-17-73	142.	7.4	1.8	1.33	413.	1.9	638.	8.21	USGS	ANDERSON CLINKER
8S 41E 24DCAA	11- 9-76	304A.	33.5	.7	.20	4649.	2.9	5148.	7.42	USGS	SMITH COAL
8S 41E 25CCAA	10-14-73	1832.	23.2	.5	3.95	3620.	45.9	4900.	8.05	USGS	ANDERSON COAL
8S 42E 15BCCD	11-10-76	1712.	21.5	.5	.63	2876.	2.9	3402.	7.36	USGS	AMDERSON COAL
8S 42E 26CBAB	11-15-73	1311.	7.7	.2	.09	2826.	12.2	3710.	8.21	USGS	ANDERSON COAL
8S 42E 29BDAC	11-10-76	847.	10.0	.5	1.97	1547.	1.6	2033.	7.86	USGS	ALLUV.AMDER. CR.
8S 43E 13ACCA	6-19-75	129.	8.7	.5	.52	578.	2.2	946.	7.59	USGS	ANDERSON OB
8S 43E 23DABA	2-26-74	3080.	19.6	.5	.25	4754.	7.9	5492.	7.46	USGS	UNKNOWN
8S 43E 29DABC	10-26-73	811.	7.5	1.1	1.41	1485.	3.5	1930.	8.29	USGS	DIETZ COAL
8S 43E 30BBCD	11-15-73	634.	6.4	.5	1.54	1139.	2.4	1550.	7.78	USGS	DIET7 COAL
8S 44E 2AADC	11-16-73	487.	8.0	.6	2.24	1276.	12.5	1830.	8.59	USGS	DIET2 COAL
8S 44E 15BCC	6- 4-75	1079.	7.3	.4	1.04	1802.	1.5	2760.	7.57	USGS	ANDERSON COAL
8S 44E 22CCD	6-19-75	274.	3.9	.7	3.00	607.	.8	944.	7.25	USGS	ANDERSON COAL
8S 44E 35ADCC	6-19-75	55.	6.0	.6	1.76	429.	.4	742.	7.32	USGS	FAR ABOVE AND.
8S 44E 35ADCC	2- 3-74	71.	6.7	.6	1.67	452.	.4	750.	7.84	USGS	FAR ABOVE AND.
8S 45E 4ACAA	2-27-74	2992.	20.0	.6	.36	3760.	6.3	4485.	7.33	USGS	ALLUV.M-BEAR CR
8S 45E 16DDCB	2- 2-74	3526.	20.6	.2	.41	5439.	6.3	5835.	7.72	USGS	ALLUV.MUD SPR.CR
8S 45E 20BBAB	2- 2-74	2028.	13.9	.6	5.51	3208.	3.9	3650.	7.69	USGS	UNKNOWN
8S 45E 27BDAD 1	1-31-74	3808.	19.8	.5	3.09	5961.	8.7	6377.	7.74	USGS	DIET7 COAL
8S 45E 33BAAC	2- 1-74	2908.	23.5	.7	.47	4749.	6.6	5272.	7.77	USGS	AL.MAC ALIST.DR
8S 45E 33BABB	1-30-74	3128.	21.3	.7	9.04	5003.	5.2	5005.	7.65	USGS	ALLUV.VANCE CR.
8S 45E 33BBDD	2- 2-74	2334.	20.1	.1	1.29	3347.	5.1	3845.	6.00	USGS	AL.MACALIST DR.
8S 45E 34CAAC	1-30-74	2182.	15.0	.4	.66	3516.	5.5	4038.	7.60	USGS	ALLUVIUM-BEAR CR
8S 46E 5DDAD	2- 7-74	1758.	8.8	.7	1.06	2444.	5.0	3070.	8.25	USGS	AL.L.BRADSHAW CR
8S 48E 12AACA	7-22-76	5.	13.4	1.1	.04	496.	28.9	841.	7.72	USGS	TULLOCK
8S 48E 13BDDD	7-28-76	20.	6.5	1.1	< .02	529.	27.7	884.	7.87	USGS	TULLOCK ?
8S 50E 25CBD	7-20-76	1339.	4.9	.1	.06	2051.	.7	2364.	6.78	USGS	ALLUV.BUTTE CR.
9S 38E 24CABC 1	10-15-72	1066.	6.6	.2	.23	1856.	2.0	2180.	7.79	MRMG	ALLUV.TANNER CR.
9S 38E 24CABC 2	4-26-73	120.	4.3	2.2	1.78	1088.	43.0	1560.	8.98	MBMG	CANYON COAL
9S 39E 14BDAD	10-17-73	10.	3.5	2.8	.99	843.	49.2	1370.	8.82	USGS	AND.-DIETZ COAL
9S 40E 3ACAB	5- 2-75	1.	3.9	4.0	.07	832.	55.8	1340.	8.03	MBMG	CANYON COAL
9S 40E 4CDA	6-18-75	2592.	14.7	.8	2.44	3899.	5.8	4468.	7.44	USGS	DIET2 COAL
9S 40E 17ACAC	7-14-72	273.	5.1	2.9	1.45	1302.	54.3	1870.	8.69	MBMG	AND.-DIETZ 1 C.

NOTE
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Analyses continued from preceding page

LOCATION	WELL DEPTH (METERS)	STATIC WATER LEVEL (METERS)	LAND SURFACE ALTITUDE (METERS)	DATE SAMPLED	TEMPERATURE(C)	CALCIUM (CA)	MAGNESIUM (MG)	SODIUM (NA)	POTASSIUM (K)	IRON (FE)	MANGANESE (MN)	SILICA ($SIO2)	BICARBONATE (HCO3)	CARBONATE (CO3)
9S 40E 21CACD	33.5		1083.	5- 4-76	15.0	34.	11.	1390.	9.9	.89	.02	11.0	1996.	0.
9S 40E 21CACD	33.5		1083.	10-14-72	15.0	31.	13.	1355.	9.4	.02	.03	10.4	1996.	19.
9S 40E 21CDBD	69.2	35.7	1089.	4- 7-76	13.0	3.	1.	445.	3.6	.06	.01	7.9	1183.	0.
9S 40E 21CDBD	69.2	35.7	1089.	10- 2-75		3.	1.	440.	3.8	.16	.01	8.1	994.	97.
9S 40E 21CDBD	69.2	35.7	1089.	10-12-73	14.0	3.	1.	445.	3.9	.02	< .01	8.6	1143.	0.
9S 40E 21CDBD	69.2	35.7	1089.	9-13-72	13.5	2.	2.	448.	3.6	< .01	< .01	16.3	1154.	14.
9S 40E 21CDBD	69.2	35.7	1089.	7-14-72	13.0	6.	0.	450.	3.7	.09	< .01	19.3	1139.	23.
9S 40E 22DAAD	51.5	12.4	1053.	10-18-73	10.0	18.	22.	710.	7.8	< .01	< .01	9.4	1578.	51.
9S 40E 22DADA	51.8	12.5	1055.	8-17-72		6.	8.	616.	5.4	< .01	< .01	16.3	1416.	127.
9S 40E 29CCAD	46.6	11.9	1073.	10-16-73	11.0	4.	1.	450.	3.8	.02	.01	7.4	970.	104.
9S 40E 29CCAD	46.6	11.9	1073.	7-27-72	10.9	3.	2.	455.	3.7	< .01	< .01	17.1	985.	102.
9S 40E 30AADD 1			1079.	9-10-77	13.0	10.	5.	685.	6.2	.01	.01	10.0	1806.	0.
9S 41E 8CACD			1076.	6-18-75	12.5	11.	6.	798.	7.2	< .01	.01	8.3	2124.	0.
9S 41E 9ACPC	8.8	1.5	1071.	10-14-73	10.5	86.	185.	350.	11.5	.01	.01	27.0	626.	0.
9S 41E 12MDCD			1123.	2-27-74	11.5	227.	129.	231.	8.4	1.02	< .01	11.5	493.	0.
9S 41E 26AADA	12.2	2.7	1124.	6-24-75	11.0	84.	183.	820.	11.2	< .01	.15	4.4	317.	0.
9S 41E 35DADD	54.9	32.6	1158.	11- 9-76	11.0	170.	110.	552.	7.5	.10	.01	9.0	692.	0.
9S 42E 25DCAD			1128.	6- 3-75	9.0	284.	275.	1036.	6.5	.02	.02	10.5	650.	0.
9S 42E 35DCCC	30.5	9.1	1156.	11- 9-76	9.0	322.	314.	840.	7.4	.75	.10	8.6	446.	0.
9S 43E 7BCAD			1106.	10-30-73	9.0	122.	169.	230.	4.0	.02	.03	10.7	323.	0.
9S 43E 10BBAD	22.9	3.7	1073.	2-26-74	9.5	268.	256.	813.	27.6	< .01	< .01	8.2	493.	0.
9S 43E 15DABC			1091.	10-29-73	10.0	6.	4.	640.	4.8	< .01	< .01	7.7	1682.	79.
9S 43E 27CDCA	73.2		1146.	10-28-73	11.0	6.	4.	580.	3.7	.01	.01	7.6	1262.	0.
9S 44E 1ADAA	100.6		1219.	2-28-74	12.1	11.	5.	652.	4.6	< .01	< .01	8.4	1662.	73.
9S 44E 7ADAA	21.3		1103.	10-30-73	10.0	192.	315.	650.	7.9	.02	.02	13.3	383.	0.
9S 44E 7ADAA	21.3		1103.	2-28-74	7.5	277.	322.	616.	6.8	< .01	.01	11.5	596.	0.
9S 44E 10CBAD			1134.	6- 4-75	9.0	272.	457.	911.	7.8	.03	< .01	10.4	716.	0.
9S 44E 11DAAA	53.3	7.9	1252.	6- 3-75	10.5	72.	72.	35.	3.9	.02	< .01	8.3	332.	0.
9S 44E 20DCAA			1119.	6- 4-75	8.0	380.	451	1120.	12.2	.09	1.51	11.9	854.	0.
9S 44E 27ABCA			1133.	6- 4-75	8.0	382.	332.	930.	7.9	.05	.28	10.8	756.	0.
9S 44E 28DDCA	61.0	7.0	1134.	10-27-73	11.0	10.	5.	658.	4.5	< .01	.02		1727.	0.
9S 45E 3ADCC	25.0	6.0	1165.	1-30-74	10.0	190.	142.	1120.	19.5	.87	.37	13.8	780.	0.
9S 45E 7CCA	79.2		1189.	2- 2-74	12.2	10.	4.	531.	3.9	.05	< .01	8.4	1415.	0.
9S 45E 11ACD	5.8	.6	1172.	6- 3-75	8.0	164.	136.	550.	8.9	.02	.02	11.1	931.	0.
9S 45E 12CACC		38.9	1198.	1-30-74	10.5	7.	5.	447.	3.2	.04	< .01	8.0	1225.	0.
9S 45E 16AAAD	9.1	1.9	1190.	1-31-74	7.8	257.	170.	263.	6.8	.02	.04	14.5	547.	0.
9S 46E 3AABA	15.2	4.6	1173.	1-31-74	4.5	208.	244.	885.	7.5	.03	< .01	14.6	555.	0.
9S 46E 4ACBC	48.8		1165.	1-31-74	10.5	8.	5.	580.	3.9	< .01	< .01	7.7	1463.	36.
9S 46E 5BCBC 1	16.2	8.0	1164.	1-30-74	9.0	349.	280.	460.	6.1	.04	2.55	14.1	638.	0.
9S 46E 5BCBC 2	100.6	45.7	1161.	1-30-74	9.0	8.	2.	508.	3.8	.02	< .01		1357.	0.
9S 46E 5BCBD	92.0	34.1	1161.	3-17-76	12.0	4.	5.	588.	4.0	.32	< .01	8.3	1372.	0.
9S 46E 5DDAC	11.6	2.2	1161.	1-29-74	6.5	459.	316.	400.	5.6	.02	.02	14.7	392.	0.
9S 46E 5DABD	50.3	17.1	1161.	1-29-74	9.0	30.	10.	800.	6.2	.02	< .01	9.0	1879.	0.
9S 46E 6ADAD	23.2	7.2	1164.	1-30-74	6.0	276.	355.	394.	6.7	1.18	.07	10.0	97.	0.
9S 46E 6ADDA	91.4	35.3	1164.	2- 1-74	6.5	10.	1.	509.	3.8	.01	< .01	8.4	1297.	24.
9S 46E 11BDCC	48.8	20.4	1205.	2- 3-74	11.0	75.	67.	490.	8.3	.01	.12	9.4	795.	0.
9S 46E 12DABA	5.5	2.3	1253.	2- 2-74	4.5	464.	676.	181.	22.5	.06	.06	15.4	659.	0.
9S 46E 15CADD	67.1	18.3	1200.	2- 5-74	8.0	122.	120.	785.	10.4	.02	.03	14.7	1401.	0.
9S 47E 31CCDC	21.3	10.4	1170.	6- 2-75	10.0	167.	167.	894.	14.5	.01	.21	8.6	1157.	0.
9S 49E 24CCBC	42.7	25.3	1109.	7-27-76	13.0	7.	2.	260.	2.6	.03	< .01	6.4	568.	0.
9S 51E 21DABA	53.3	20.1	1085.	7-20-76	10.5	144.	36.	664.	8.5	1.41	.22	6.6	383.	0.
10S 42E 1AADA	30.5	16.9	1195.	11-16-73	10.0	141.	114.	150.	5.6	< .01	.08	10.6	336.	0.
10S 43E 2AABA	92.0		1117.	10-29-73	12.0	8.	3.	509.	4.2	.01	.01	8.1	1359.	0.

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Analyses continued on following page

LOCATION	DATE SAMPLED	SULFATE (SO4)	CHLORIDE (CL)	FLUORIDE (F)	NITRATE (NO3 AS N)	DISSOLVED SOLIDS CALC. AS RESIDUE)	SODIUM ADSORPTION RATIO (Sa,Ca,Mg)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25 C)	PH LABORATORY)	COLLECTING AGENCY	CONTRIBUTING AQUIFER
9S 40E 21CACD	5- 4-74	1496.	18.9	.3	4.33	3956.	53.3	5559.	8.12	MRMG	ANO.-DIETZ 1 OB.
9S 40E 21CACD	10-14-72	1120.	16.4	.4	7.23	3772.	51.3	5060.	8.40	MRMG	AND.-DIETZ 1 OB.
9S 40E 21CDAD	4- 7-76	0.	17.4	2.8	.04	1062.	59.4	1702.	8.06	MRMG	AND.-DIETZ 1 C.
9S 40E 21CDAD	10- 2-75	2.	4.5	2.9	.05	1051.	58.3	1740.	9.13	MRMG	AND.-DIETZ 1 C.
9S 40E 21CDAD	10-12-73	5.	15.3	1.3	< .02	1045.	56.6	1590.	8.11	USGS	AND.-DIETZ 1 C.
9S 40E 21CDAD	9-11-72	11.	16.3	2.7	.05	1083.	56.3	1690.	8.45	MRMG	AND.-DIETZ 1 C.
9S 40E 21CDAD	7-14-72	8.	16.2	2.6	< .02	1089.	48.0	1660.	8.52	MRMG	AND.-DIETZ 1 C.
9S 40E 22DAAD	10-18-73	275.	35.3	.9	1.99	1907.	26.7	2840.	8.43	USGS	AND.-DIETZ 1 C.
9S 40E 22DADA	8-17-72	8.	13.2	1.9	2.26	1500.	38.2	2340.	9.10	MRMG	AND.-DIETZ 1 C.
9S 40E 29CCAD	10-16-73	8.	12.8	1.0	< .02	1073.	52.6	1750.	9.02	USGS	AND.-DIETZ 1 C.
9S 40E 29CCAD	7-27-72	22.	16.4	2.2	< .02	1106.	51.9	1740.	9.50	MRMG	AND.-DIETZ 1 C.
9S 40E 30ARDD 1	9-10-77	32.	25.0	1.7	.03	1462.	45.2	2537.	7.79	MRMG	AND.-DIETZ1&2COAL
9S 41E 8CACD	6-18-75	4.	19.6	2.7	.38	1901.	49.6	2955.	7.89	USGS	UNKNOWN
9S 41E 9ACRC	10-14-73	1152.	11.0	.3	1.69	2132.	4.9	2620.	7.88	USGS	ALLUV.,DEER CR.
9S 41E 26AADA	6-24-75	2340.	10.1	.2	.20	2043.	3.0	2546.	7.85	USGS	SMITH COAL ?
9S 41E 35DADD	11- 9-76	1454.	20.0	.7	1.31	2673.	8.0	3412.	7.62	USGS	ALLUV.SF DEER CR
9S 42E 25DCAD	6- 3-75	3404.	19.5	.4	1.20	5357.	10.5	6537.	7.43	USGS	UNKNOWN
9S 42E 35DCCC	11- 9-76	3373.	12.0	.4	.84	5098.	8.0	5732.	7.52	USGS	ALL.NF WADDLE CR
9S 43E 7BCAD	10-30-73	1194.	5.5	.1	3.05	1897.	3.2	2310.	7.80	USGS	UNKNOWN
9S 43E 10RRAD	2-26-74	2976.	56.0	.3	.18	4648.	8.5	5650.	7.15	USGS	ANDERSON OB.
9S 43E 15DARC	10-28-73	59.	19.0	.9	1.94	1551.	49.0	2250.	8.01	USGS	DIETZ COAL
9S 43E 27CDCA	10-28-73	45.	22.4	1.1	< .02	1209.	39.6	1900.	8.24	USGS	ANDERSON COAL
9S 44E 1ADAA	2-28-74	1.	16.0	2.1	.09	1590.	40.8	2531.	8.56	USGS	SUB-POLAND
9S 44E 7ADAA	10-30-73	2716.	14.2	< 1	1.42	4098.	6.7	4340.	7.69	USGS	ANDERSON COAL
9S 44E 7ADAA	2-28-74	2804.	13.9	.2	1.92	4346.	6.0	4960.	7.53	USGS	ANDERSON OB.
9S 44E 10CRAD	6- 4-75	3788.	18.0	.3	19.77	5836.	7.8	7524.	7.86	USGS	ANDERSON OB.
9S 44E 11DDAA	6- 3-75	273.	9.0	.6	.75	633.	.7	980.	7.66	USGS	ALL.FF TRAIL CR.
9S 44E 20DCAA	6- 4-75	4394.	29.0	.4	1.69	6822.	9.2	8658.	7.73	USGS	UNKNOWN
9S 44E 27ABCA	6- 4-75	3596.	13.5	.3	1.47	5646.	8.4	7273.	7.67	USGS	ALLUV. TRAIL CR
9S 44E 28CDCA	10-27-73	0.	13.1	< .1	.32	1539.	43.2	2450.	8.08	USGS	ALLUV. TRAIL CR
9S 45E 3ADCC	1-30-74	2776.	15.0	.5	6.21	4668.	15.0	5530.	7.33	USGS	ANDERSON COAL
9S 45E 7CCA	2- 2-74	1.	15.2	2.0	< .02	1271.	36.5	1990.	8.14	USGS	ANDERSON COAL
9S 45E 11BCD	6- 3-75	1361.	9.4	.3	2.48	2701.	7.7	3545.	7.20	USGS	AND.-DIETZ COALS
9S 45E 12CBCC	1-30-74	3.	15.9	2.0	.72	1093.	32.4	1750.	8.17	USGS	ALLUV. BEAR CR
9S 45E 16AAAD	1-31-74	1433.	8.3	.4	.16	2422.	3.1	2920.	7.61	USGS	ANDERSON COAL
9S 46E 3AAAB	1-31-74	2916.	16.2	.5	.68	4565.	9.9	5560.	8.04	USGS	ALLUV.MAPLE CR.
9S 46E 4ACRC	1-31-74	11.	15.0	1.4	.16	1387.	39.8	2191.	8.67	USGS	AL.PASTURE CR.
9S 46E 5RCRC 1	1-30-74	2472.	15.5	.3	.14	3917.	4.4	4338.	7.67	USGS	CANYON COAL
9S 46E 5RCRC 2	1-30-74	3.	14.8	2.2	< .02	1208.	41.7	1933.	8.29	USGS	AL.BOXELDER CR.
9S 46E 5RCRD	3-17-76	11.	14.5	2.5	.06	1232.	40.3	1947.	8.25	USGS	WALL COAL
9S 46E 5DAC	1-29-74	2916.	12.5	.3	1.74	4319.	3.5	4772.	7.77	USGS	SUB-CANYON
9S 46E 5DARD	1-29-74	295.	3.8	1.5	1.90	2042.	32.1	3226.	8.10	USGS	DIETZ COAL
9S 46E 6ADAD	1-30-74	2784.	15.7	.2	.09	3898.	3.7	4302.	8.10	USGS	CANYON COAL
9S 46E 6ADDA	2- 1-74	0.	17.1	2.9	.09	1214.	41.7	1916.	8.35	USGS	DIETZ COAL
9S 46E 11BDCC	2- 3-74	851.	12.2	.4	1.13	1905.	9.9	2640.	7.89	USGS	SUB-CANYON
9S 46E 12DABA	2- 2-74	3428.	27.3	.4	45.63	5185.	1.3	5733.	7.96	USGS	DIETZ COAL
9S 46E 15CBDD	2- 5-74	1283.	22.2	.4	4.61	3051.	12.1	4135.	7.47	USGS	SMITH OVERBURDEN
9S 47E 31CCDC	6- 2-75	2054.	11.9	.5	7.00	3894.	11.7	4940.	7.29	USGS	SUB-DIETZ
9S 49E 24CCRC	7-27-76	113.	5.0	.8	< .02	676.	22.2	1104.	8.16	USGS	UNKNOWN
9S 51E 21DARA	7-20-76	1636.	6.0	.2	.05	2651.	12.8	3460.	7.82	USGS	UNKNOWN
10S 42E 1AADA	11-16-73	868.	7.6	.2	.66	1443.	2.3	1830.	8.01	USGS	UNKNOWN
10S 43E 2AARA	10-29-73	0.	17.0	1.0	1.97	1221.	39.3	1910.	8.16	USGS	POLAND OB.
											ANDERSON COAL

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Analyses continued from preceding page